ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

A gang of workmen was employed last week in digging a trench between the Executive Mansion and the State, War and Navy buildings for laying a telephone wire between the President's office and the offices of Assistant Secretary Day, Secretary Long and Secretary Alger. The telephone will be private and will enable the President to be in constant prompt communication with the heads of departments during the expected hostilities.

A London cable dispatch says that Rychnowski, an electrician of Lemberg, claims to have discovered an electric fluid, which he calls "electroid." The discovery has caused a great sensation on the continent. He obtained it by electrolysis; but it is not identical with electricity. Its effects are declared to be startling, producing light and causing Geissler tubes to emit fluorescent rays. It works photochemically, rotates objects in mid-air, produces whirlpools in water and kills bacteria. Metal and glass thereby can be charged with electricity, and the magnetic needle changes direction under its influence.

The duration of slate roofs is variously placed, but is usually given as 60 years. A resident of Bangor, Pa., informs a contemporary, however, that in 1863, when he was living in England, he assisted in removing the slate from the roof of a building of the Plymouth dockyards that was known to have stood over 300 years. After the old building had been torn down a new structure was erected on the same site, and the slates, after being redressed, were placed on the new roof, and at last accounts were still there.

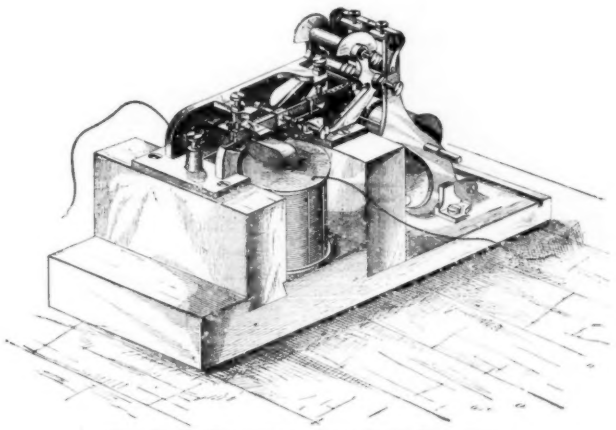
The names telephone and microphone are older than the instruments now designated thereby. As far back as 1827, says an exchange, Wheatstone gave the name of microphone to an apparatus invented by him, to render weak sounds audible, and in 1845 a kind of steam whistle or trumpet, which had the purpose of giving roaring signals in foggy weather, was called telephone by Capt. John Taylor, while Sudre used the same name in 1854 for a system of musical telephony.

On the night of December 3 last, an aged couple named Mr. and Mrs. John Cocklin, living about eight miles from Schenectady, N. Y., in the town of Glenville, were brutally assaulted by two robbers. They were placed on a red hot stove and tortured in other ways. The night of this crime was the same as that on which George R. Blodgett, the General Electric patent attorney, was murdered by burglars, and it has been generally believed that both acts were committed by the same persons. A few days ago in Salem, Washington County, Mr. and Mrs. Cocklin positively identified "Buck" Davis, the burglar, as the man who had tortured and robbed them. Detectives who have been working on the case believe they will be able to fasten the Blodgett murder on Davis.

The packing houses of Swift & Company and Nelson Morris Company in St. Joseph, Mo., and that of Cudahy, in Sioux City, Iowa, will soon be operated by electricity.

One of the largest firms in Germany is that of Siemens & Halske, in Charlottenburg. The buildings occupy nearly 270,000 square feet of ground, and 4,000 men are employed. There are 1,366 machine tools in the shops, driven by shafts and belting, while 444 are driven by direct-connected electric motors. There are 472 electric motors in regular use in the works.

Killing by electricity succeeds hanging as the method of putting condemned criminals to death in Massachusetts. The Governor has signed the bill and executions will take place in the State prison, Charlestown. The proviso occasioned a visit of General Bridges, the warden of the Charlestown prison, to the State house, where he consulted with the Governor. It is understood that he will go to work at once to make the provision for the proper enforcement of the new law, and will have plans made, though there is no one in the State at the present time on whom the new system can be tested. The new law will not apply to those now under indictment, nor to any person who committed murder prior to the act going into effect.



THE FIRST TELEGRAPH RECORDING REGISTER.

Prof. Hugh L. Callendar has resigned the chair of physics, and Prof. C. A. Carus-Wilson the chair of electrical engineering at McGill University, Montreal. Professor Callendar has been appointed to the chair of physics in University College, London, vacated by the resignation of Prof. Carey Foster.

THE FIRST TELEGRAPH RECORDING REGISTER.

AN INTERESTING AND VALUABLE RELIC ACQUIRED BY CORNELL UNIVERSITY.

In a recent issue of the ELECTRICAL REVIEW appeared a communication from Mr. Stephen Vail, of New York city, giving some interesting particulars of the early work of his father, Alfred Vail, in the early field of telegraph invention. The accompanying illustration shows Vail's first telegraph recording register, on which was received the original telegraph message, "What hath God wrought?" This instrument was recently presented to the Sibley College of Engineering of Cornell University by a generous benefactor. In this connection the following letter from Mr. Stephen Vail is interesting:

"Enclosed I send you copy of the statement which was found attached to the old recording receiver upon its removal from a cabinet at my father's house at Morristown, N. J., and in which he had placed it years before.

"The instrument was taken out of this cabinet (for the first time since the death of my father in 1859) in June, 1871, for the purpose of sending it to New York to be used at the celebration at the Academy of Music on the evening of June 10, 1871, in honor of the dedication of the statue to Morse in Central Park, which had taken place that afternoon.

"This paper was found attached to the base of the instrument, and was partially torn in the removal. It has been preserved, and, in a frame, has been a portion of my exhibit at the Natural Museum in Washington for the past 20 years and more."

The statement referred to is as follows:

"This lever and roller were invented by me in the 6th story of the New York *Observer* office in 1844, before we put up the telegraph line between Wash. & Balt., and the same have always been used in Morse's instruments. I am the sole and only inventor of this mode of telegraph embossed writing. Prof. Morse gave me no clue to it, nor did any one else, and I have not asserted publicly any right as first and sole inventor, because I wished to preserve the peaceful unity of the invention, and because I could not, according to my

contract with Prof. Morse, have got a patent for it. ALFRED VAIL."

Below will be found a copy of the agreement entered into between Samuel F. B. Morse and Alfred Vail on September 23, 1837:

Articles of agreement made this 23d day of September, in the year of our Lord, one thousand eight hundred and thirty-seven, between Prof. Samuel F. B. Morse, of the University of the City of New York, in the City and County and State of New York, of the first part, and Alfred Vail, of Speedwell (Morristown), in the Township and County of Morris, and State of New Jersey, of the second part, as follows, to wit, viz.:

Whereas the said Samuel F. B. Morse, of the first part, has invented a new machine for the transmission of intelligence, called the "Electromagnetic Telegraph," and to secure to himself the benefits of his invention, he is preparing to take out letters-patent of the United States, and he hereby associates himself with the party of the second part in this undertaking, upon the following terms and conditions:

First. The party of the second part covenants to construct and to put into successful operation, *at his own proper cost and expense*, one of the telegraphs of the plan and invention of the party of the first part, and to exhibit its full power and value before a committee of the Congress of the United States, on or before the 1st of January, eighteen hundred and thirty-eight.

Second. All expenses, which in the judgment of both parties, shall necessarily be incident to the final completion and perfection of the said plan of telegraphic communication, shall be defrayed by the said Vail, of the second part, *who also agrees to devote his time and personal services faithfully to this object without charge.* The expenses of obtaining letters-patent from the United States, are intended to be included as a part of the incidental expenses, as well as all machinery and apparatus which may be found to be necessary for testing, by actual and speedy experiment, the efficiency of the mode of transmitting intelligence.

Third. And it is hereby further agreed between the said parties of the first and second parts, that in case either of them shall make any new discoveries which will be applicable to said telegraph or any new invention which will tend toward perfecting the same in any manner, he will, as soon as practicable, communicate the same to the other, and it shall be held as the property of each, in the same proportion as their respective rights in the whole, and the expenses of taking out letters-patent for such new discovery or invention, if such letters-patent be mutually thought to be necessary, shall be defrayed by each, in the same proportion as he holds of the whole, by these presents hereinafter mentioned.

Fourth. In consideration of the aforesaid payment of money (mentioned in Article 2, of this agreement), and such other aids as are promised, and shall be undertaken and fulfilled by the said Vail, of the second part, the said Samuel F. B. Morse, of the first part, doth, hereby, assign, transfer and convey, to the said Alfred Vail, of the second part, and to his heirs and assigns forever, one equal undivided one-fourth part of all his interests and rights, which he now holds, or which may accrue by means of the said invention of the "Electromagnetic Telegraph" and by the proposed patent to be secured to him as aforesaid, so far as any benefits and advantages may arise therefrom.

Fifth. It is also agreed by the said Morse of the first part, that, provided that said Vail of the second part will procure to be taken out letters-patent for this invention, in any or all of the foreign countries of the globe, he shall be entitled to one equal and undivided one-half of all the benefits, profits and advantages arising therefrom, and it is further agreed by said party of the second part, that the said letters-patent for the exclusive right to use such invention of the "Electromagnetic Telegraph" in France, England, Scotland and Ireland shall be taken out in any or all of these countries with the least possible delay, and as soon as the models necessary for that purpose shall be sufficiently completed to test their efficiency, and that no unnecessary delay be incurred, these models shall be immediately commenced, as provided for in Article 2 of this agreement.

Sixth. In event of the entire failure of the aforesaid invention, and its abandonment by the parties to this covenant, it is mutually agreed that all the machinery, apparatus, etc., made since the date of this agreement shall be the exclusive property of the said Vail.

Seventh. It is further agreed by the said party of the second part, that the letters-patent taken out for France, England, Scotland and Ireland, in compliance with Article fifth, *shall be taken out in the name* and for the exclusive benefit *of said Morse*, of the first part, and it is hereby agreed by the said party of the first part, that, as soon as he has obtained them, he shall immediately assign, transfer and convey to the said party of the second part, one equal undivided one-half of all his interest and rights by said letters-patent secured to him.

In testimony whereof we have hereunto set our names and seals.

In the presence of
E. O. MARTIN,
ROBERT BOYLE.

SAMUEL F. B. MORSE,
ALFRED VAIL.

A Government Cable Repair Ship.

A dispatch from Key West, Fla., states that the government lighthouse tender "Mangrove" is being fitted out as a cable repair ship.

THE WAR PREPARATIONS.

WHAT ELECTRICIANS AND OTHERS ARE DOING TO HELP UNCLE SAM.

During the past few weeks prominent electrical engineers in several of the larger cities have organized volunteer electrical corps, drawing their recruits from local electrical companies. Dr. Louis Duncan, of Johns Hopkins University, Baltimore, was among the first to effect a practical organization of volunteers, and, although he was confined to his bed by a severe illness for more than a week, he laid out orders and so perfected matters that his men were of great value to the army engineer officers, having in charge the defenses of Baltimore. Dr. Duncan's experiences as a naval officer, and his well known ability as an electrical engineer, especially qualify him for the work he undertook. The corps organized by Dr. Duncan included a number of his students from the electrical department at Johns Hopkins, and these men proved to be exactly the right men in the right place.

In Washington, Mr. O. T. Crosby, the well known electrical engineer, also organized a volunteer electrical corps, which has been doing practical work for some weeks past. One of the members of this corps has written the following battle hymn:

Full fifteen cents per Kilowatt
We'll charge the Spanish foe,
We'll riddle them with Amperes
And their fuses we will blow;
And Chamberlain will lead us
By short circuits that he knows,
To where we can with Porcelain Knobs
Bombard our hated foes.

And our Sub-Chief, brave Memler,
He will just remove his hat,
And when the Spanish see his hair
They won't know where they're at;
They'll think it is the flashing
Of a thousand-pounder gun,
And they won't do a blessed thing
But tuck their tails and run.

Oh! we're the Second Division,
Charged with Alternating juice;
Don't ever try to head us off.
For it won't be any use;
And when we meet the Spanish
They will get some awful jolts,
For we're wound for Humsteed Amperes
And nine hundred thousand volts.

Mr. John Jacob Astor, who is well known as an electrical experimenter and is connected with several electrical enterprises, has offered his palatial yacht, the "Nourmahal," to the government for use as a torpedo-boat destroyer, and has also offered the services of one of his railroads for the transportation of troops. President Poor, of the National Park Bank, New York city, has tendered the services of his powerful institution, with its 5,000 correspondent banks all over the country, to assist the government in placing a popular loan if such is required. President John A. McCall, of the New York Life Insurance Company, who is well known to many electrical men, has assured President McKinley that his company is prepared to loan the government at once $10,000,000 at a low rate of interest.

The especial aptitude of electrical engineers and electricians generally for emergency work has been strikingly illustrated several times during the past few weeks. In one case it was desired to install a searchlight plant on a harbor fortification some miles from a coast city. Besides the searchlight apparatus, cables and wire, it was necessary to purchase and install at the earliest possible moment a steam engine and boiler plant. A corps of electrical men working under the direction of army engineer officers undertook to supply and install the material required. The electrical portion of the plant was at once secured and transported to the fort. The boiler was purchased and laid down on a pier, from which the army officers expected to carry it by means of a scow to the fort. When the boiler arrived at the pier the army officers discovered that there was no scow available for the purpose. They were nonplussed and at once began to make arrangements to secure a scow from a distant port.

The electrical men who had undertaken to install the plant were not to be balked by such a mishap, and told the army officers they would deliver the boiler at the fort in the time agreed upon. One of the army officers asked how they were going to do it. An electrical man replied that they didn't know how, but they were going to do it. After the army officers had departed to look up the matter of securing the scow, one of the electricians sat down in the lee of the boiler and put on his thinking cap. After a few minutes he announced that he had arrived at a plan, which he and his friends immediately proceeded to put into effect. After a few minutes' work with hemp, wooden plugs and hammers, the electrical men succeeded in plugging up all the holes in the boiler and promptly rolled it off the pier in the water. It was found that the boiler would float. The services of a tug were at once engaged, a line was made fast to the boiler, and it was towed with all possible speed to the fort.

In the meantime the steam engine had been purchased, loaded on a four-horse truck and started for the pier, accompanied by three or four electricians. When the six o'clock whistles blew, the Irishman who drove the truck announced that he would work overtime for no man, promptly stopped his truck in a side street about half a mile from the pier, and was preparing to unhitch his team and go home. One of the electrical men took the Irishman aside and informed him that he had done great service for the government during the day and therefore deserved a drink. While this electrical man was providing several drinks for the Irishman in a nearby saloon the other electrical men promptly stole the truck, drove it to the pier, unloaded the steam engine and proceeded with it on a tug to the fort, abandoning the Irishman's horses and truck on the pier. Needless to remark, the plant was installed within the time agreed upon.

The story which appeared in the ELECTRICAL REVIEW two weeks ago regarding the cutting of a torpedo cable by a suspected Spanish sympathizer or spy has stirred up the electrical manufacturers engaged upon government work to unusual activity. At least one suspect has been discharged by a prominent manufacturing company, who took this and other radical steps on apparently good evidence. It is safe to say that from this time forth the endeavors of Spanish sympathizers will meet with prompt exposure at the hands of electrical manufacturers.

Mr. H. G. Stott, electrical engineer for the Buffalo General Electric Company, has had considerable personal experience with the Spanish character, as the result of having been sent to Madrid by an English company to install an electric lighting plant. In the course of a talk with a reporter for the Buffalo, N. Y., *Commercial*, Mr. Stott is quoted as saying:

"We could not prevent foremen of construction gangs from robbing the workmen under them. They would bleed them for a portion of their miserable wages, and no matter what we paid, the foremen got the greater part of it. We discharged man after man in that capacity, only to find that the next one we employed was doing the same thing.

"We could not employ Spaniards to read meters, after the company began to supply light, for they would invariably go to the consumer and make an arrangement to turn in a short reading for a given consideration. We tried several men in this capacity, and each time we would find, after the first reading, that the quantity of current used fell off, and we soon learned the cause. A Spaniard of high respectability that I

knew in Madrid told me that he never thought of paying what his gas bills properly came to. He gave the meter reader four or five pesetas a month and the fellow cut the reading down enough to save him three or four times that amount.

"When men of good standing hold such ideas and talk about them as a matter of course, you can appreciate what a moral rottenness there is throughout the Spanish character.

"Our contract was to put in the electric lighting plant and run it six months successfully, which we did. At the end of that time the Spanish company which was to manage it thereafter offered me double the salary I was getting from the English company and a three years' contract at the figure, if I would stay and manage the plant. But I had had enough. I was utterly disgusted with the Spaniards and I would not stay a day beyond the time when the contract of the English company expired."

The Walker Company, of Cleveland, Ohio, has received a contract from the United States Government for the building of some very large gun carriages weighing many tons. The government desires to make use of the company's large foundries in order that the work may be quickly done.

Electric Railways in Japan.

In answer to a request for information from the United States Export Association, of New York (to whom the report has been forwarded), Consul Lyon writes from Hiogo, Kobé, Japan, under date of March 1, 1898, substantially as follows:

There are three electric railways projected in this consular district. One is to be 15 miles in length, extending from Kobé to Amagasaki. The company has a capital of 500,000 yen ($249,000) and the work is to be completed within two years. The time for beginning the work is not fixed.

Another line is to be between Amagasaki and Osaka, five miles. The company is to have a capital of 300,000 yen ($149,900). The charter has not yet been granted. The promoters of these two roads are Mr. Shinyemon Konishi, of Itamicho, Kawabe-gun, Japan; Mr. Ki-ichiro Kosone, of Minato-cho, Kobé-shi, Japan, and 28 others.

Another road is projected to run from Kobé to Armina, 15 miles. The capital is 300,000 yen ($149,900). The date for commencing the work is not fixed. The promoters are Mr. Ki-ichiro Naka, of Arino-mura, Arima-gun, Japan; Mr. Shigezo Yamamoto, of Fukiai-mura, Kobé-shi, Japan, and 18 others.

EXHIBITORS AT THE ELECTRICAL SHOW.

A COMPLETE LIST TO DATE OF THOSE WHO WILL PARTICIPATE.

Below the ELECTRICAL REVIEW prints a list, complete up to the time of going to press, of the exhibitors who will take part in the electrical exhibition which begins at Madison Square Garden, New York city, on May 2.

Armorite Interior Conduit Co., Pittsburgh, Pa.
American Rheostat Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
American Watchman's Time Detector, 234 Broadway, New York.
American Engine Company, Bound Brook, N. J.
Adams-Bagnall Electric Company, Cleveland, Ohio.
Armington & Sims Co., Providence, R. I.
American Electrical and Maintenance Co., 451 Greenwich street, New York.
American Electrician Co., New York.
American Electrical Works, Providence, R. I.
American Electric Novelty and Manufacturing Co., 231 Broadway, New York.
American Circular Loom Co., Boston, Mass.
American Mutoscope Co., 837 Broadway, New York.
Ashcroft Manufacturing Co., 111 Liberty street, New York.

Bullock Electric Co., St. Paul Building, New York.
Bossert Electric Construction Co., Utica, N. Y.
Baylis Co., The, 99 Cedar street, New York.
Borne, Scrymser Co., 80 South street, New York.
Belknap Motor Co., Portland, Me.
Brewster Engineering Co., 27 Thames street, New York.
Barrows & Co., C. H., 302 W. Fifty-third street, New York. (Electrical vehicles.)
Broomell, Schmidt & Co., York, Pa.
Boston Electro Duct Co., Boston, Mass.
Burhorn & Granger, 136 Liberty street, New York. (Woodbury engine.)
Babcock & Wilcox Co., 29 Cortlandt street, New York.
Boston Blower Co., Hyde Park, Mass.
Berlin Iron Bridge Co., East Berlin, Ct., and 95 Nassau street, New York.

Crocker-Wheeler Electric Co., 39 Cortlandt street, New York.
C. & C. Electric Co., 143 Liberty street, New York.
Corey, R. B., 26 Cortlandt street, New York.
Coho & Co., H. B., 220 Broadway, New York.
Card Electric Co., Mansfield, Ohio.
Camp Co., H. B., Aultman, Ohio.
Cleveland Twist Drill Co., Cleveland, Ohio.
Crouse-Tremaine Carbon Co., Fostoria, Ohio.
Crown Woven Wire Brush Co., Salem, Mass.
Cook's Sons, Adam, 313 West street, New York.
Cutter Electrical and Manufacturing Co., Philadelphia, Pa.
Consolidated Safety Valve Co., 111 Liberty street, New York.

De La Vergne Refrigerating Machine Co., 138th street and East River, New York. (Hornsby-Akroyd Oil Engine.)
Diamond Electric Co., Peoria, Ill.
Diesel Motor Co., of America, 11 Broadway, New York.

Edison, Thomas A., Orange, N. J.
Edison Electric Illuminating Co. of New York, Duane and Elm streets, New York.
Eddy Electric Manufacturing Co., Windsor, Ct.
Electric Storage Battery Co., Philadelphia, Pa.
Excelsior Electric Co., Brooklyn, N. Y.
Edison Manufacturing Co., Orange, N. J.
Edison, Jr., Thomas A., 96 Broadway, New York.
Electrical Engineer, New York.
ELECTRICAL REVIEW, New York.
Electrical Age Publishing Co., New York.
Electricity Newspaper Co., New York.
Electrical World, New York.
Elliott & Hatch Book Typewriter Co., 253 Broadway, New York.
Electrical Engineer Institute of Correspondence Instruction, 120 Liberty street, New York.
Electric Vehicle Co., 1684 Broadway, New York.

Fischer Foundry and Machine Co., Pittsburgh, Pa.
Fort Wayne Electric Corporation, Fort Wayne, Ind.
Fuel Economizer Co., Matteawan, N. Y.
Fostoria Incandescent Lamp Co., Fostoria, Ohio.
Fiberite Co., Mechanicsville, N. Y.
Fairchild & Sumner, 39 Cortlandt street, New York.
Francis Brothers, Philadelphia, Pa.

Gold Car Heating Co., Cliff and Frankfort streets, New York
Garton-Daniels Electric Co., Keokuk, Iowa.
Garvin Machine Co., Spring and Varick streets, New York.
General Incandescent Arc Light Co., Thirty-third street and First avenue, New York.
Griffing Iron Co., A. A., Jersey City, N. J.

Harrison Safety Boiler Works, Germantown Junction, Philadelphia, Pa.
Highland Chemical Co., Cornellsville, Pa.
Haines Co., Wm. S., Philadelphia, Pa.
Haring Steam Plant Equipment Co., 26 Cortlandt street, New York.
Hope Electric Appliance Co., Providence, R. I.
Hayden & Derby Manufacturing Co., 111 Liberty street, New York.

Ideal Electric Corporation, Thirteenth and Hudson streets, New York.
Imperial Porcelain Works, Trenton, N. J.
India Rubber and Gutta Percha Insulating Co., Glenwood, N. Y.
International Arc Lamp Co., Mercer and Houston streets, New York.

Jones & Son, J., 69 Cortlandt street, New York.

Keuffel & Esser Co., 127 Fulton street, New York.
Kelley & Sons, B. F., 91 Liberty street, New York.
Keystone Electrical Instrument Co., Ninth street and Montgomery avenue, Philadelphia, Pa.
Kelley & Mueller, 7 West Thirteenth street, New York.
Kosmic Oil Filter Co., Easton, Pa.
K. & W. Co., Pittsfield, Mass.
Katzenstein & Co., L., 357 West street, New York.
Kensington Engine Works, Ltd., Philadelphia, Pa.
Kirkland, H. B., 120 Liberty street, New York.
Kaufman & Alexandre, 1133 Broadway, New York.

Lewis Tool Co., 44 Barclay street, New York.
Lynn Incandescent Lamp Co., Lynn, Mass.

Morris, Elmer P., 15 Cortlandt street, New York.
Machado & Roller, 203 Broadway, New York.
Mowrey, P. M., & Co., 318 Broadway, New York.
Monarch Manufacturing Co., Waterbury, Ct.
Montauk Multiphase Cable Co., 100 Broadway, New York.
Mergenthaler Linotype Co., Tribune Building, New York.
Manhattan Electric Storage Battery Co., 636 Broadway, New York.

Niles Tool Works Co., Hamilton, Ohio, and New York.
National Meter Co., 118 Chambers street, New York.
Nowotny Electric Co., Cincinnati, Ohio.
National Carbon Co., Cleveland, Ohio.
Nash Gas Engine Co., 99 Cedar street, New York.
New Britain Machine Co., New Britain, Ct.
New York Safety Steam Power Co., 80 Cortlandt street, New York.
New York Car Wheel Works, Buffalo, N. Y.
New York Telephone Co., 18 Cortlandt street, New York.
National Photograph Machine Co., 85 Beaver street, New York.
National Phonograph Co., Twenty-fifth street and Broadway, New York.
Nonpareil Cork Manufacturing Co., Gerken Building, New York.

Oswego Boiler Works, Oswego, N. Y.
Otis Electric Co., 38 Park row, New York.
Onondaga Dynamo Co., Syracuse, N. Y.

Paragon Arc Lamp Co., Boston, Mass.
Peru Electric Manufacturing Co., Peru, Ind.
Peckham Motor Truck & Wheel Co., 26 Cortlandt street, New York, and Kingston, N. Y.
Partrick, Carter & Wilkins, Philadelphia, Pa.
Paragon Electric Fan Motor Co., 39 Cortlandt street, New York.
Porter & Remsen, 39 Cortlandt street, New York.
Prindle Pump Co., 136 Liberty street, New York.
Partridge Carbon Co., Sandusky, Ohio.
Pope Manufacturing Co. (Motor Carriage Department), Hartford, Ct.
Platt Manufacturing Co., O. S., Bridgeport, Ct.
Roebling's Sons Co., John A., Trenton, N. J.
Riker Electric Motor Co., 45 York street, Brooklyn, N. Y. (Electric Vehicles).

Safety Insulated Wire & Cable Co., 229 West Twenty-eighth street, New York.
Stephenson Co., Ltd., John, 47 East Twenty-seventh street, New York.
Silex Insulation Co., 39 Cortlandt street, New York.
Sprague Electric Co., 20 Broad street, New York.
Simonds Manufacturing Co., Pittsburgh, Pa.
Sinclair, D. J., Caledonia, N. Y.
Street Railway Journal Co., New York.
Street Railway Review, Chicago, Ill.
Shaw, H. M., 136 Liberty street, New York.
Samson Cordage Works, Boston, Mass.
Sims Dudley Defence Co., 120 Liberty street, New York.
Sheridan, T. W. & C. B., 2 Reade street, New York.
Stanley & Patterson, 32 Frankfort street, New York.

Translucent Fabric Co., Quincy, Mass.
Thomas & Sons Co., R., East Liverpool, Ohio.
United States Electrical Supply Co., 141 East Twenty-fifth street, New York.
Thomson Press Co., John, 253 Broadway, New York.

Universal Electric Co., 126 Liberty street, New York.

Vacuum Oil Co., Rochester, N. Y.
Van Horne, Burger & Co., Dayton, Ohio.

Ward Leonard Electric Co., Bronxville, N. Y.
Worthington, Henry R., New York.
Walker Co., Cleveland, Ohio.
Weston Electrical Instrument Co., Newark, N. J.
Warren Electric Manufacturing Co., Sandusky, Ohio.
Williams & Co., J. H., Brooklyn, N. Y.
White, J. G., & Co., 29 Broadway, New York.
Western Electrician, Chicago and New York.
Worthington Water Tube Boiler, 30 Cortlandt street, New York.
Williams, J. P., 39 Cortlandt street, New York.
Warren-Medbery Co., Mechanicsville, N. Y.
Wilday, J. H., 23 Duane street, New York.
Warren Electric and Specialty Co., Warren, Ohio.

Zimdars & Hunt, 127 Fifth avenue, New York.
Ziegler & Co., Boston, Mass.

Mr. Frank S. Marr, of the Helios Electric Company, Philadelphia, was among the visitors to New York city last week.

New York Electrical Society.

In consequence of the illness of Prof. Sidney H. Short, and the fact that so many of the members of the society are engaged in active work on the electrical exhibition, it has been decided to give Professor Short's lecture on "The Outlook of Heavy Electric Traction" during the exhibition.

At the electrical exhibition there will be various demonstrations of scientific phenomena and principles by means of models and apparatus, which will be in more or less continuous operation. As the society has been entrusted with a great deal of work of this kind, it would like to secure from among its members the help of volunteers, to take charge of various features from time to time; the duty will not be heavy, but will be made as light as possible.

The first applications will be selected, preference being given, as far as possible, in case there be a large number of applicants, to students of educational institutions. The assignment to duty will be in the hands of a committee of the society and Exhibition Company, and the work of such members will be publicly recognized.

American Institute of Electrical Engineers.

The 124th meeting of the Institute will be held at 12 West Thirty-first street, New York city, on Wednesday, April 27, 1898, at 8 o'clock P. M. A paper will be presented by Prof. W. E. Goldsborough, of Lafayette, Ind., entitled "An Economy Test of a Central Station." Also a paper by Charles J. Reed, of Philadelphia, Pa., on "A Novel Form of Thermo-Electric Battery." This paper will be accompanied by experiments with the apparatus described.

Henry Electrical Society.

The 102d meeting of the Henry Electrical Society will be held on Friday evening, April 29, 1898, at Columbia University, 116th street and Amsterdam avenue, in the Engineering Building, Room 302.

On this evening Prof. F. B. Crocker will address the members of the society on "The Design of Circuits for Electrical Distribution," the questions of regulation being illustrated by numerous experiments.

Franklin Institute.

Mr. Frank J. Sprague, of the Sprague Electric Company, New York city, is the author of a paper entitled "The Multiple-Unit System of Electric Railways," read before the electrical section of the Franklin Institute at Philadelphia on April 26.

INSULATION AND CONDUCTION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MARCH 23, 1898, BY REGINALD A. FESSENDEN.

(*Continued from page 231.*)

It will be noticed that in the table given, while the metals follow each other in the order they should from calculation, yet the agreement is in some cases not so close as in others. This may arise from several causes: 1. The conductivities of but few of the metals are accurately known. 2. The elasticities of but few of the metals are accurately known, and the formula given for the Young's modulus only roughly takes temperature into account. 3. The temperature coefficients of the metals are not the same. For instance, that for copper is over .4, .415 having been obtained by Swan and Rhodin, and .404 by Kennelly and the writer, while silver is only .38 and gold .36. Consequently the ratio will vary with the temperature, and at higher temperatures the ratio, resistivity of copper; resistivity of silver, will be less. This, it is interesting to note, holds true for the velocity of sound, for from Wertheim's results we have, velocity of sound in silver; velocity in copper = 1.35 at 20 degrees centigrade, and only 1.19 at 200 degrees centigrade, and hence, just as in the case of electrical conductivity, the sound conductivity of copper diminishes at a faster rate than that of silver.

The magnetic metals, as iron and platinum, are very difficult to obtain pure. Their true resistance is therefore at present doubtful.

What has been mentioned thus far concerning the resistance of solids has had no immediate bearing on the subject of insulation. It was necessary, however, in order to introduce the following considerations:

In the formulas the valency was introduced. This term has no definite meaning, as the valency varies with the compound. Consider the writer's chart of the elements (Fig. 3) a modification of those of Meyer, Newlands and others. On one side are seen the metals of the arts. Above them in vertical rows are marked the figures 1, 2, 3, 4, etc. These figures indicate the number of chemical linkages, which, as a general rule, the elements under the figures tend to take up. But there is no very definite rule. Among the univalent metals some unite with bivalent atoms, as does copper, and in general all that can be said is that a certain valency holds generally and not in general. Consequently, when we find that by taking a group of metals having very closely the same values of Young's modulus, as, for instance, gold, silver and aluminum, their conductivities are, within the limits of errors of observation, proportional to the velocity of sound ÷ valency; and that in any of the group of metals having the same valency the conductivity is directly proportional to the velocity of sound, within experimental errors, we are to a certain extent justified in making a choice of valencies when this is needed. Fortunately, however, this only occurs in two cases: 1. We must suppose copper to have twice the valency of silver, which we might, *a priori*,

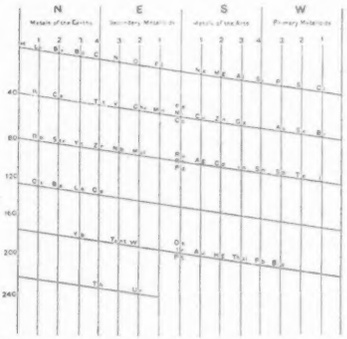


FIG. 3.—"INSULATION AND CONDUCTION."

have granted, for though they are in the same group, yet copper has markedly through all its salts twice the valency that silver has. 2. That thallium has twice the valency of aluminum, a supposition which has no other justification than the fact that, since the formula holds in other cases where the valency is known, we have a certain right to use the formula to find the valency.

Now it is well known, especially from facts in organic chemistry, that similar atoms or molecules can combine together to form what are called polymerized substances. For instance, three molecules of C_2 H_2 acetylene can form one molecule of benzol, C_6 H_6. In general we find that these polymerized compounds are more crystalline and have higher melting points than the original substance. Also we note that the number of atoms in such a polymer is generally a multiple of the valency of the atom. Carbon, for instance, seems to prefer to go in groups of four.

Considering now the table of elements, we see that as we pass along from row to row, and as the valency increases, the substances get more crystalline and in many ways evince a linking together.

1. As mentioned, they are crystalline.

2. Their specific heats get abnormally low, this indicating that they are polymerized or plexed.

3. They are capable of existing in allotropic forms.

4. Their vapor densities show that several atoms are joined together into one molecule, and hence they are almost certainly polymerized as solids, since the general tendency of heat is to disassociate. Consequently there is some evidence for the theory that metalloids differ only from metals in that they have a greater tendency to polymerize from their higher valencies, which are probably in some way dependent upon the shapes of the atoms, and are so more crystalline, etc. We might, therefore, look for some evidence of polymerization among the metals. This is readily found as before from the variation of the specific heat from its theoretical value. If this linkage were but loose, it is evident that it might affect the specific heat but little, and yet have a marked effect on other phenomena. For instance, we might suppose that it would affect long sound waves less than short ones.*

We might therefore consider that when the period of a sound wave coincides with that of the molecules, it is a heat wave; the period of the amplitude of a sound wave being the period of the heat wave. If this be proven by experiment we would have this relation: The electric conductivities are in the same ratio as the velocities of very short sound waves, being thus analogous to Maxwell's law for the velocity of light in insulators, in that the velocity varies with the periodicity. We have seen above that the electric resistivity varies directly as the valency. Also it has been indicated that there is some evidence to show that the polymerization or plex varies as the valency. Therefore we are led to assume that increase of resistance accompanies polymerization or the linking together of the atoms into groups. We see that this might hinder the transmission in various ways, since the groups would not vibrate so quickly as the single atoms and there would be fewer of them per unit cross-section. Anything, therefore, which tends to give molecular complexity, tends to give high resistance, hence we see why alloys are generally higher in resistance than the average of their components.

The resistance increases with density and molecular complexity and inversely with the elasticity. Consequently whether a resistance increases or decreases with temperature will depend upon whether the molecular union is weakened at a less or greater rate than the elasticity falls off.

In getting a concept of this we may consider a conductor as analogous to a government department, the different atoms or officials being bound together into groups by valency bonds, the analogue to which is evidently "red tape." The rate at which a given impulse is handed on will evidently depend inversely upon the amount of red tape and the density, or stupidity, of the individual official. The two causes are often confused.

We must therefore, for solid insulation, get substances which are strongly linked together, of great density, and of small modulus of elasticity. The first is the property which varies most, since density and elasticity vary between comparatively narrow limits.

3. Conductivity in Fluids.—The nature of the manner in which electricity is conducted in electrolytes has been very thoroughly worked out by Clausius, Arrhenius, Hittorff, Kohlrausch, Nernst Ostwald and others, and the work of these physicists has led to the linking together of results in a way which is simply marvelous. As the results can be obtained from works on physical chemistry, a very brief résumé is given.

The atoms of a solid are held together by the force of cohesion and driven apart by the hitting of the atoms on each other, due to the fact that they are in vibration, possessing kinetic energy proportional to the temperature. The molecule may also be pulled apart by the cohesive attractions of its atoms for other atoms. Whether a substance is a solid or a gas depends upon whether the fraction

$$\frac{\text{Cohesive force of atoms for one another} + \text{external force}}{\text{Kinetic repulsion} + \text{cohesive attraction for other atoms}}$$

is greater or less than unity. We can thus turn a substance into a gas in two ways; i. e., by increasing the kinetic energy of the atom by heating it, or by bringing it in contact with other atoms, when, if the sum of the terms in the denominator is greater than the numerator, it will dissolve.

We have to distinguish two kinds of linkages in solids, the cohesive force of the atoms for one another in uniting to form a molecule, and the attraction of the molecules for each other. The former generally is stronger than the latter; consequently we may have a substance which, on being put into contact with a solvent, will have its molecules pulled apart from one another, but not its atoms. In the presence of another solvent, however, the second term may be sufficiently great to pull apart not only the molecules, but also the atoms of the molecules. The substance is then said to be not only dissolved, but disassociated. But dissolved substances give an osmotic suction per square centimeter, which is equal numerically to the kinetic pressure which the substance would have if it were turned into a gas at the same temperature and volume as the solution. A number of proofs of more or less validity have been given for this, but it seems to the writer to follow at once from the obvious fact that if we take a solid and heat it and dissolve it, the kinetic repulsion must always equal the cohesive attraction plus the vapor pressure when equilibrium is reached.

(*To be continued.*)

*The writer ventures to suggest that the velocity of very short waves of sound in copper may be found somewhat less than half of that given now for audible tones, while that of lead may be reduced to but one-eighth of its value as given at present.

ELECTRIC RAILWAY NOTES.

The South Side Elevated Railroad, of Chicago, commenced running some of its trains by electricity on April 20.

The old Main street electric line, of Cincinnati, Ohio, has been purchased by Chas. H. Kilgour, of the Consolidated, for $278,000 cash. The sale was at a public auction.

The earnings of the West Chicago Street Railroad Company for the week ending April 3 were $74,214, as against $70,898 for the corresponding week last year, an increase of $3,316.

The Thompson Electric Railway Company, of Baltimore, Md., is erecting a scenic railway at Point Breeze to cost $10,000. The improvements in the aggregate will cost over $75,000.

The Henderson, Ky., Street Railway's property has been sold under an execution in favor of Mrs. Marilly Wood for $1,000. The property was appraised at $65,000, and mortgaged for $60,000.

Several Pittsburgh traction companies have combined for the purpose of erecting and maintaining a storage-battery plant, which will supply current to the trolley systems entering into the agreement.

A 50-year franchise has been granted the Pennsylvania & Ohio Railway Company to build and operate an electric line from Conneaut, Ohio, westward, connecting with the Cleveland, Painesville & Eastern.

The Milwaukee, Racine & Kenosha, Wis., Electric Railway Company has called in all of its old bonds and issued another series of 375 bonds, $1,000 each, to the Savings and Trust Company, of Cleveland, Ohio, bearing interest at six per cent, and running 30 years.

The stockholders of the Easton, Palmer & Bethlehem, Pa., Electric Railway Company have elected the following directors: Charles A. Richardson and W. L. Kindall, of Worcester, Mass.; Charles E. Barns and N. S. Myric, of Boston, and E. J. Fox, T. A. H. Hay and William O. Hay, of Easton. The directors will commence building the road at a very early date.

The Dayton, Ohio, & Western Traction Company, which has a franchise and right of way to build an electric street railroad from Dayton to Eaton, mortgaged its road and equipment to the Central Trust Company, of New York, for $400,000. This large sum of money is to be used to complete and equip the road from there to Eaton, a distance of 25 miles. The road is now partially built, the power-house and machinery being placed.

ELECTRIC LIGHT FLASHES.

The Citizens' electric light plant, of Houston, Tex., has been damaged by fire, at a loss of $150,000.

Elizabethville, Pa., is to be lighted by electricity. Mr. A. B. Collier has secured the contract and right of way.

The earnings for March of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1898.	1897.	Increase.
Gross	$263,975 67	$207,870 47	$56,105 20
Net	113,223 85	94,418 93	18,804 92
Gross, three months	$819,163 90	$660,973 48	$158,190 42
Net, three months	378,186 27	324,970 06	53,216 21

The Union Electric Power and Light Company, of Jackson, Cal., has been incorporated; capital stock, $1,000,000. The stockholders and trustees are Oliver Ames and Samuel Carr, Boston; G. McM. Ross and Benjamin Johnson, Copperopolis, and F. D. Nicol, Stockton.

The Herkimer County Light and Power Company, of Herkimer, N.Y., with a capital of $400,000, has been formed by the consolidation of the Herkimer Gas Light Company, of Herkimer, the United Gas and Electric Light Company, of Little Falls, and the Ilion & Mohawk Gas Light Company, of Ilion. The directors are William F. Cochran and Alexander S. Cochran, of Yonkers; George E. Weed, Maitland F. Griggs, Thomas E. O'Shea, Henry Stanton, Robert P. O'Shea and James P. O'Shea, of New York city, and Thomas Ringwood, of Ilion.

Surveying by Bicycle.

The demand for a speedy method of making preliminary surveys without the usual array of engineers and instruments seems to have been met by a device recently invented by John Riddell, of the General Electric Company, Schenectady, N. Y., and entitled an instrument for delineating topographical peculiarities and measuring and recording distances.

It is small and compact, and may be mounted on a bicycle or upon any wheeled vehicle drawn by horses or pushed by hand or foot. It is shown in the illustration mounted on the horizontal upper bar of a bicycle, and consists, briefly, of a vertical revolving cylinder carrying the record, and a marker moved upwards and downwards by the inclination upwards or downwards of the upper bicycle bar.

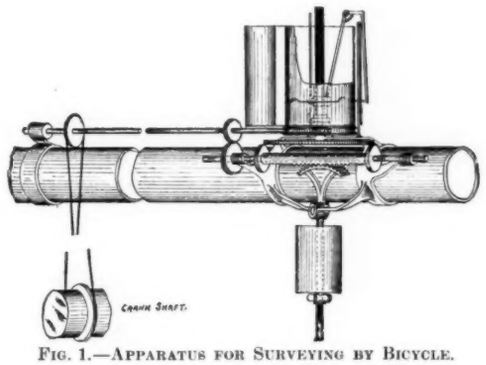


FIG. 1.—APPARATUS FOR SURVEYING BY BICYCLE.

The metal cylinder carrying the paper for the record is provided at the lower end with a worm-wheel engaging with a worm on a shaft running toward the rear of the bicycle and driven by a lace belt from a pulley on the crank shaft. Movement of the bicycle produces, therefore, revolution of the record cylinder, which, as it revolves, unwinds the paper for the record from a small drum.

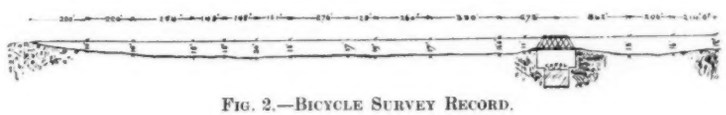


FIG. 2.—BICYCLE SURVEY RECORD.

The marker is mounted on a nut on a threaded vertical rod, movement of which raises or depresses the nut and the marking point. The lower end of the rod is fastened to a horizontal disk free to move clockwise or the reverse. Beneath the disk, and just clearing it on each side, are two smaller disks at each end of a toothed sleeve, and revolving vertically. Through the sleeve passes the disk shaft provided with a gear-wheel meshing into a small gear on the main shaft driven from the crank axle.

Suspended beneath the bar of the bicycle, and, consequently, beneath the entire machine, is a pendulum having at its upper end a toothed quadrant meshing into the teeth of the sleeve on the shaft carrying the vertical disks. As the small disks revolve in the same direction, one in contact with the large horizontal disk revolves it clockwise and causes the marker to ascend, the other counter-clockwise, depressing the marker. The nearer the center of the large disk the small disk comes, the faster the former moves and the sharper the angle described by the marker.

It will be seen that the pendulum hangs vertically, whatever be the angle of inclination of the bicycle. If the machine is ascending, the horizontal bar assumes an obtuse angular position to the pendulum, the rear vertical disk is brought beneath the horizontal disk and the marker moves upward; if a declivity is descended, the angle of the bar and the pendulum becomes acute, the forward disk comes into play and the marker moves downward. On the level, both vertical disks are out of contact with the horizontal disk, and the marker records a plain horizontal straight line.

A part of a record is shown in Fig. 2. The number of feet above the level are shown by the horizontal line, the distance traveled by the length of the record. It is part of a record made on a wheel ridden from the gates of the General Electric Company's factory to the main street of Schenectady.

The value of a device of this character will readily be appreciated by military, civil and railroad engineers. At present, if a piece of road requires survey, or the lay of the land in a certain direction is to be ascertained, a system of survey is necessary, involving considerable time and labor. Recent mention was made of the rapidly accomplished survey of 49.22 miles in 19 hours by means of a bicycle and compass. The mapping of the line surveyed occupied several hours additional labor. With a device of the character of that mentioned the completed topographical profile could have been ascertained in the time taken to propel the wheel over the length of the road surveyed.

It could also be widely used by bicyclists and drivers of horses or livery stable keepers and in the development of road maps, which, at present, give distances only and not gradients.

Electrical Review

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At last we can say a good word for acetylene. The steel cylinders in which calcium carbide is shipped have been used, in at least one instance, for submarine mines charged with dynamite. These have been placed, the ELECTRICAL REVIEW can confidently assert, in the harbor of an important sea coast city, and we are informed that the cylinders make excellent mine casings. This is but natural, as they were designed to carry a high explosive, which is proved in the present emergency.

WAR.

War between Spain and the United States has formally begun. The American people have responded instantly to every patriotic duty. The administration has received moral and concrete support which leaves nothing in doubt—least of all, the result of the war.

No one can certainly foretell the length of the struggle, nor any of the unusual sacrifices we may be called upon to make. The fact stands out, like a searchlight beacon in the dark, that the people are ready and willing for anything which will tend toward the success of the principles for which we are fighting.

No professional class of men has been so prompt and willing to afford assistance in war preparations as those in the electrical industry. They are trained to emergency work. A battle is an emergency. On land or sea, it will be found that electricians can fight as well as work.

Electrical engineers, electrical manufacturers and electricians, during the past few weeks, have performed valuable and highly appreciated services for the government in its war preparations. These services have been largely performed in coast and harbor defence, coast fortifications and the preparation and laying of submarine torpedoes and mines. A number of manufacturers have practically turned over their plants to the filling of government orders; electricians, linemen and wiremen have promptly volunteered their services, and electrical engineers, especially those who have served in the army and navy, have practically given up their private affairs in order to devote their whole time and talents to important government work. The engineer corps of the army, especially, has derived valuable assistance from electrical engineers. This is not a fitting time to record just what services have been rendered to the government by the electrical fraternity, but the ELECTRICAL REVIEW has reliable information that the help afforded has been most highly appreciated, and by no one more than the President, the Secretary of the Navy and the Secretary of War.

THE ELECTRICAL EXHIBITION.

The electrical exhibition will open its doors to the public at Madison Square Garden, New York city, next Monday, May 2. An extensive list of exhibitors has been secured, numerous attractive features have been arranged, and the indications point to an even more successful and instructive exhibition than the one which achieved such brilliant success in 1896. With the experience of the former show as a precedent, the management of the present enterprise has been able to improve, to a large extent, upon the advance preparations and to avoid certain undesirable features. From what we know of the plans to be carried out, we can confidently assert that the general public as well as the electrical fraternity can not afford to miss seeing this show.

It has been suggested that the war may tend to interfere with the attendance at the electrical exhibition. The ELECTRICAL REVIEW is informed that reliable statistics show that during our late Civil War the attendance at the theaters and other places of amusement was extraordinarily large, and that the business carried on by these resorts was especially profitable. The people seemed to want relaxation, and sought it in places of amusement. If the present may be judged by the past, therefore, the electrical exhibition is certain of an unusually large attendance. The exhibition and the special features to be provided will merit any one's careful attentions.

ELECTRICAL PICTURE TRANSMISSION.

The idea of picture transmission electrically is no new thing. It has from time to time bobbed up during the past 20 years and found place in the daily papers or periodicals under various names indicating the same idea. Szczepanik has, however, gone a step in advance, and seems to have really some hope of success by his traveling beams of light acting on the selenium cell, which latter, we believe, was first exploited by Professor Bell as a possible means for transmitting pictures. The details so far published are hardly sufficient for any intelligent criticism to be attempted

WALL STREET AND THE ELECTRICAL STOCK MARKET.

At this writing the course of the stock market indicates that it is not free from the professional influences which have characterized it during the past few weeks. Briefly stated, the investing and speculating public is still waiting. Where last week it waited for the declaration of war, today it waits for developments that will indicate whether the war is likely to be a serious drag on our commercial and industrial prosperity or not. Security values have yielded less than many bargain-hunters hoped for. But it was not due to improved general buying. It was simply support afforded to the market by strong interests.

General Electric was moderately traded in and fluctuated within a narrow range, selling down from 31¾ on Monday to 30¼. The annual meeting of the company will be held in Schenectady on May 10. A report from Boston circulated to the effect that owing to the commencement of hostilities there was a likelihood that the plan for a settlement with the preferred stockholders would not be presented at the annual meeting. The matter, however, is still under discussion. Notwithstanding the war, officials of the company report that business in nearly all the departments shows no falling off. Some important electrical equipments will be begun by the Metropolitan Street Railway Company shortly, and a good contract was received from the Milwaukee Electric Light and Power Company this week calling for motors and generators.

Some buying of an investment character was noted in Western Union. The quotation followed the rest of the market, selling down from 86 to 84⅜. The collateral 5's changed hands at 105. The earnings of the company at present are exceeding the estimates of the officers, chiefly on account of the war excitement, and it is believed that the present quarter will show a marked increase over last year.

North American sold at 5⅛ to 5¼. A little more than 2,000 shares changed hands. American Telegraph & Cable was very quiet at 90 to 91.

Metropolitan Street Railway Company continues to make further plans for the application of electricity to its traction lines and also for new ventures. The remaining horse-lines will be the first ones to be equipped with electricity and Broadway will follow. It is understood that the pre-

liminary work of securing the consent of property owners along Broadway and Columbus avenue has already begun. Some of the leading interests in the company, according to good authority, have also identified themselves with the new telephone company, which expects to construct an extensive system of subways and work in opposition to the existing monopoly.

The earnings of the Edison Electric Illuminating Company of New York for March were: Gross, $263,975, and net, $113,223; the latter being an increase of $18,804 over March, 1897. For the first three months of the year the earnings were: Gross, $819,163, and net, $378,186; the latter comparing with $324,970 for the first quarter last year.

The Chicago Edison Company has declared the regular quarterly dividend of 3 per cent.

The Supreme Court, of Illinois, has reaffirmed its decision of two years ago, denying an injunction against the construction of the General Electric Railway, of Chicago. Steps will be taken to finance the company and the work carried out.

The preferred stock of the Street Railway and Illuminating Company, originally amounting to $4,500,000, has all been retired at or below 110 through the sale of securities. The stock of this company was floated in 1893 in connection with the liquidation of the floating debt of the General Electric Company, the stock being sold at the rate of one share of common and one of preferred for $100 in cash to stockholders of the General Electric, or for $90 to the underwriting syndicate. The first dividend on the common stock was paid February 12 of this year, being at the rate of 6 per cent annually. The remaining shares of common stock (4,500) will hereafter receive all future benefits from the securities remaining in trust. Upon the liquidation of the preferred shares the par value of the common stock should be the value of the trust estate.

Edison Electric of Boston declared a dividend of 1¾ per cent, payable May 2.

Dealings in electrical stocks on the Boston Exchange were nominal. Bell Telephone opened at 250, sold down to 247½, regained all its loss subsequently and closed at 248. Erie Telephone sold at 62 @ 62½, and closed at 60 bid, 61 asked. New England Telephone was quoted at 125. Westinghouse common sold at 20¾ @ 21, with 20 offered, 21 asked at the close, and the preferred at 50 @ 50½.

Electric Storage Battery common on the Philadelphia Exchange was quoted at 19, while the preferred ranged between 21 and 22.

Wall Street, April 23. RAY.

ELECTRICAL EXHIBITION NOTES.

A special committee of the Auxiliary and Educational Committee has just drawn up on behalf of the Electrical Exhibition, to be held at Madison Square Garden, New York city, May 2–31, a plan whereby prizes to the value of not less than $100 are offered to the pupils in the public and private schools in New York and its vicinity for essays on the Electrical Exhibition. This committee, comprising Prof. F. B. Crocker, Mr. G. H. Guy and Mr. T. C. Martin, has realized the fact that a great many young people will visit the exhibition, not merely from idle curiosity, but from a desire to learn, and it is believed that many such visitors will be encouraged in this way in their intelligent study of electrical principles, phenomena and inventions. The essays will be limited to 1,500 words, and will be accepted up to May 18, the awards being declared and prizes presented not later than May 28. No contestant is to be over 16 years of age, and the judges will be selected chiefly from the staff of the colleges and schools of New York city.

Considerable interest is attached to the exhibit of the electric elevator machine for the London Underground Railway, which is to be shown at the Electrical Exposition to be held in Madison Square Garden, commencing May 2. The London machines of this type are the largest elevator machines ever built, and were built by the Sprague Electric Company.

A series of eight illustrative and historical wax tableaux (designed to mark some of the successive stages of electrical development), prepared by Dr. Park Benjamin, Prof. F. B. Crocker and Mr. T. C. Martin, executed and arranged by the Eden Musee Company, will be a feature in the Concert Hall. The series will include the First Recognition of an Electric Effect, when the Syrian woman, centuries before our era, wonderingly perceived light objects flying to her amber spindle; the Mariner's Compass, ascribed to the Chinese and Italians, but probably to be credited to the Finns, in the eleventh century; the Earth, a great magnet—William Gilbert explaining the Terella to Queen Elizabeth, 1600; the First Conductors or Circuits; Stephen Gray, a Charter-house pensioner in London (1720), experimenting on the conduction of electricity; the Leyden Jar, showing the bottling of electricity and the terrible shock to Dean Von Kleist, canon of the cathedral in Cumin, in Pomerania, 1746; the Identity of Lightning and Electricity—when Benjamin Franklin drew down the lightning from the skies, 1752; the Beginnings of the Modern Primary Battery or Voltaic Cell, with Galvanis famous frog experiment, 1791, and the Beginnings of Modern Dynamo-Electric Machinery, showing Michael Faraday's famous experiment, 1831. These tableaux are accompanied by a selection from Dr. Park Benjamin's celebrated library of early philosophical, technical and electrical books, each illustrating some feature or stage of electrical evolutions.

Mr. Chas. Chamberlain has been placed in charge of the Press Bureau of the Electrical Show. The press committee is composed of Hugh Harrison, Chas. W. Price and W. D. Weaver.

The officers of the Electrical Exhibition Company are C. O. Baker, Jr., president; F. W. Roebling, vice-president; George F. Porter, secretary and treasurer; Marcus Nathan, general manager; executive committee, H. H. Harrison, L. F. Reqna and C. O. Baker, Jr.; Prof. F. B. Crocker, consulting engineer; Max Osterburg, construction engineer; Thomas A. Edison, Jr., committee on decorative effects.

For some time past the Hebrew Technical Institute, of New York city, has made a great success of its instruction in the technical branches of electricity as distinguished from the mere teaching in a manual or trade school. Evidences of the ability of the students under Mr. Ker will be given at the Electrical Exhibition, where opportunity is being afforded for an excellent display of the electrical engineering skill of the boys. Not only will a number of instruments be entered for the model making competition, but these will be supplemented by other instruments and apparatus built by them, to illustrate principles and phenomena. There will also be a complete small plant in operation lighting a small house. A collection of blue prints and photographs will also be included.

Mayor H. J. Smith, of Pompton, N. J., one of the best known experts in the world in submarine explosives, mines, etc., has very kindly tendered his services to the exhibition management for the demonstration in a special tank of the manner in which harbors are protected, ships blown up, etc., and some of his ingenious apparatus has been loaned for this interesting work by Mr. C. McLaughlin, of J. H. Bunnell & Company. This will probably be one of the most attractive features of the show.

Proposed Electric Works in France.

The following has been received from Consul Jackson, dated Cognac, March 24, 1898:

I have the honor to report the following proposed improvements, which may be of interest to American electrical manufacturers:

1. Proposed electric lights and electric tramways at Angoulême, Charente. Communications should be addressed to MM. P. & M. Durand & Company, Lyons, France.

2. Proposed electric lights and trolley line for the city of Cognac. Communications should be sent to M. Jules Brisson, Maire de la Ville de Cognac, Charente, France.

PERSONAL.

Dr. Allan V. Garratt, chief engineer of the Lombard Water Wheel Governor Company, of Boston, was among the visitors to New York city last week.

Mr. H. Snelling, manager of the Temple office of the Southwestern Telephone and Telegraph Company, has been promoted to the management of the Galveston, Tex., office, to take effect May 1.

Mr. C. O. Baker, Jr., the genial and popular president of the Electrical Exposition Company, of New York city, made a flying trip to Chicago last week for a conference with western electrical interests regarding the electrical exhibition.

Mr. J. J. Nate, general manager of the Standard Telephone and Electric Company, Madison, Wis., spent a couple of days in Chicago last week looking after some important contracts. Mr. Nate reports business in a flourishing condition and says his company finds no trouble in getting orders where customers want high-class apparatus.

Manager J. F. Stevens, of the Keystone Electrical Instrument Company, Philadelphia, spent Thursday and Friday of last week in the World's Fair City on his way home from an extended western trip. Keystone instruments are rapidly increasing in favor with station managers, who appreciate a thoroughly first-class indicating device.

Mr. A. O. Fox, general manager of the Northern Electrical Manufacturing Company, Madison, Wis., was among the welcome callers at the western office of the ELECTRICAL REVIEW last week. Mr. Fox spent several days at the office of Kohler Brothers completing the details of the agency arrangement whereby Messrs. Kohler Brothers have the handling of Northern apparatus in a number of states. Mr. Fox reports business in a most flourishing condition, in spite of the war scare.

Mr. W. F. Osborne, who for eight years past has been eastern manager for the *Western Electrician*, will resign that position on May 1 to accept the business management of the *National Provisioner*, of New York city, the leading weekly journal in its field. Mr. Osborne in his new position will be associated with Dr. J. H. Senner, ex-Immigration Commissioner and former editor of the New York *Staats Zeitung*. The ELECTRICAL REVIEW, while regretting to lose from the ranks of electrical journalism a gentleman so courteous and popular as Mr. Osborne, wishes him the best of success in his new field of labor.

TELEPHONE NEWS AND COMMENT.

The independent telephone company at Cedar Rapids, Iowa, announces that it has 700 telephone sets now in operation.

The New England Telephone Company is expending some $50,000 in fitting up its new exchange in Springfield, Mass. This is commendable enterprise and is appreciated by the Springfieldians.

The area covered by the Chicago Telephone Company is said to be the largest city territory of any telephone company in the world. The exchanges of this company are said to be the busiest in the world.

The Central Telephone Company is the name of a new organization started by Messrs. Hill and Teachout at Des Moines, Iowa. The officers are H. E. Teachout, president; J. W. Hill, vice-president; H. C. Hansen, treasurer; M. McFarlin, secretary. It will operate toll lines throughout the state: Its paid-up capital stock is $10,000.

It is a striking fact that in 1883, when the American Bell company's business was much less than it is today, the 200,000 shares received $18 per share in dividends and the stock sold at $200 per share. To-day, on an increased capitalization of 258,863 shares, but $15 a year are paid in dividends; yet the stock sells at a very much higher price—$250 per share.

Mr. E. B. Field, of the Colorado Telephone Company, has returned from a visit to the East. He reports that the American Telephone and Telegraph Company is planning to connect Colorado with its eastern territory. The long-distance telephone company has reached Omaha, and plans to extend to Denver and Salt Lake City. Mr. Field says work on the York street sub-station of the Colorado Telephone Company, Denver, is progressing so rapidly that it will be ready for occupancy by the middle of June.

The telephone rate war is quite lively in Jackson, Miss. The Peoples' Telephone Company charge $24 and $18 for business and residence sets per annum, and have over 400 subscribers. The Southern (now the Cumberland) has been improving its service, putting in the finest cedar poles, new wires, cables, switchboards, etc., and during the past month began to canvass the city for subscribers at 50 cents per month. The impression there now is that Jackson is going to stand by the concern that put down the prices in the first instance.

The telephone bill in the Ohio Legislature, known as the Rothe bill, has been indefinitely postponed. A Cincinnati exchange says that the bill "was conceived and born in iniquity. It was against the most urgent protests of fully 95 per cent of Cincinnati subscribers—subscribers who protested repeatedly against any interference with a service of such a quality as to make the company take first rank among all the telephone companies of the country. Cincinnati subscribers are to be congratulated on successfully escaping the impairment of this service, which the passage of the Rothe bill would have made inevitable."

No popular uprising has followed the defeat of the bill to put the telephone service of this state under the direction of the Gas and Electric Light Commission. The users of the telephone are better satisfied to pay a little more, in order to have the best of service, and the people who do not use them are willing to acknowledge that their interest is not large in the matter. In the legislature, Mr. Boutwell, of Malden, struck the nail on the head when he suggested that any such regulation should include the telegraph as well as the telephone companies. No one has ever suggested regulating telegraph tolls, though the companies do not pay taxes to the state already, as do the telephone companies. The movement against the latter was clearly one-sided.—*Boston Advertiser.*

The answer of the Chesapeake & Potomac Telephone Company to the select committee of the House, charged with making inquiries concerning telephone rates in the District, has been made. The reply is voluminous, and gives copies of all the contracts of the company now in force or at any time heretofore in force, as made by any company whose rights were acquired by the present company. The report shows that the rentals and royalties paid by the company to the American Bell Telephone Company since 1891 are $137,688.97; that the total cost of construction in the District was $477,580.94; that from the original issue of stock of $750,000, $77,234.93 was realized, and that out of all the mortgage bonds the balance was contributed. The total dividends paid since 1883 are $323,843. The gross earnings of the company are $196,724.28; the total expenses, $117,851.89, leaving net earnings of $78,872.39. The company shows a deficit in 1897 of $8,999.15.

The new long-distance telephone company, with $1,000,000 capital, was incorporated last week at Indianapolis, Ind., by the filing of the articles of incorporation, signed by A. H. Nordyke, of Indianapolis; Daniel E. Doherty, of Louisville, Ky.; Alexander F. Ramsey, of Crawfordsville, Ind.; George W. Beers, of Fort Wayne, Ind.; Harry B. Gates, Simon P. Sheerin and David M. Parry, the last three being of Indianapolis. The incorporation fee was $1,002, and is the largest fee that Secretary of State Owen has received for some time. It is understood that Mr. Beers, who is a practical electrician and experienced telephone man, is to superintend the construction of the long-distance lines, work upon some of which will be commenced within the next few days. Mr. Beers is the president of the Home Telephone Company, of Fort Wayne, and also of the National Long-Distance Telephone Company, which operates about 1,000 miles of long-distance lines in the northern and eastern parts of the state of Indiana.

The phonographic answering scheme in the San Francisco telephone exchange is said to occasionally provoke profanity. This phonograph is so arranged that when a subscriber called up a number that is busy, the phonograph answered, "Busy now. Call up later." This was the invariable reply whenever a busy number was called for, and it was given in a monotonous tone of voice. The manager said to a visitor: "You know, some of our subscribers are very profane, and perhaps you would like to hear their opinion. Here is Captain Blank, who has been calling a busy number for five minutes now. Listen to him." Captain Blank's wire was swung on to a receiver, which he put to his ear. "I never heard anything like it," said the visitor. "You blankety, blank, blank idiot," he was saying, "can't you say anything else but 'Busy now. Call up later?' There you go again, you blasted idiotic chump. I'm coming up to the central office and kill you right away." "That," said the manager, "is one of the drawbacks of this invention. It excites profane men unduly, and it might lead to violence."

The Philadelphia Electrical Exposition.

As already announced in the ELECTRICAL REVIEW, the Philadelphia Electrical Exposition Company will give an electrical exposition in its building, 818–820 Chestnut street, Philadelphia, beginning June 6, 1898, and continuing for one month. Prof. William D. Marks, the well known electrical engineer, is the director, and Mr. A. A. Lowry is the treasurer of the Exposition Company.

A feature of the forthcoming exposition will be the artistic decorations and arrangements for the exhibits. It is the desire of the management to make the affair much more than a crude showing of electrical machinery and appliances, and to that end the interior of the building will be hung with draperies, rooms will be set apart for reception parlors, Oriental smoking-rooms, etc. The management announces that it is the intention of many of the prominent exhibitors at the New York Electrical Exposition, to be held in May, to send their exhibits to the Philadelphia show. Various novelties of an electrical character have been secured, and it is stated that the General Electric Company will exhibit all of its apparatus of interest to the public.

The building will be open from 10 A. M. to 11 P. M., and is located centrally. A moderate admission fee will be charged, and a large attendance, both day and evening, is expected. Intending exhibitors may obtain full information by addressing the director, William D. Marks, Room 2, 1308 Arch street, Philadelphia.

Rose Polytechnic Institute.

The sixteenth annual catalogue of the Rose Polytechnic Institute, of Terre Haute, Ind., has just been issued. It contains an outline of the courses of study and the plan of instruction pursued at this well known institution. The course in electrical engineering is a valuable one and well laid out, to accomplish the object sought. The institute is also well equipped with physical and electrical laboratory apparatus, as well as an electric plant and machine shops.

The Atlantic Coast Telephone Company, of Atlantic City, N. J., has been incorporated; capital, $100,000. Corporators: Edwin L. Reinhold, of Marietta, Pa., and Lewis Kuchnie and James B. Reiley, of Atlantic City.

LITERARY.

Pitt & Scott, the well known foreign freight brokers and forwarders, of New York city, will soon issue a valuable work entitled "Foreign Import Duties and Foreign Shippers' Handbook of useful Information."

"How" is the title of a well printed little book of 165 pages, which is said to be the greatest book of its character of the year. It tells you how to do 150 different things of interest to men, women and children, and will be sent to any one who will cut out a coupon from *Judge*, *Demorest's Monthly* or *Leslie's Weekly*, and forward the coupon with 10 cents, in stamps or currency, to the Arkell Publishing Company, 110 Fifth avenue, New York. It is full of just the kind of information that every person wants.

"MACHINISTS' AND ENGINEERS' POCKET MANUAL." By D. B. Dixon. Leather, 371 pp., 3x4½ inches, with rubber band and pocket. Price, $1. Sent postage free on receipt of price by Electrical Review Publishing Company, Times Building, New York.

Laird & Lee have just issued in their admirable collection of technical reference books, the above manual, which is the most complete as well as compact work of the kind ever placed on the market. It includes a compilation of rules and solved problems pertaining to steam engines, steam boilers, steam pumps, etc., based on plain arithmetic, and free from algebraic difficulties, together with necessary tables, and data of highly practical value in the machine shop, mechanical drawing-room and steam-power plant. It embraces a dictionary of terms used in steam engineering and electricity; the construction and operation of dynamos and motors; artificial refrigeration and ice making; treatise on the steam engine indicator, gearing, shafting, lathe screw cutting, etc., etc. Printed on excellent paper and bound in leather, in pocket form, this work is sure to meet with wide and immediate recognition, as it has been edited by a practical engineer for practical artisans and mechanics, and is up to date in every respect.

The Sprague Electric Company have just received an additional contract for the equipment of the Library of Congress, in Washington, with Lundell exhaust fan outfits. All of the outfits will be operated by Lundell power motors.

Chemical Effect of X Rays.

On a chemical effect produced by the impact cathode rays, by Prof. J. J. Thomson and Mr. Skinner, of England, *Nature* says: "Aluminum is rapidly evaporated from the cathode by an electric discharge in a highly exhausted vacuum tube, in which air has been replaced by mercury vapor. The metal is condensed over the walls of the tube in the form of a bright mirror. An iron cathode gives a similar mirror in a mercury vapor discharge tube. When the aluminum coating is dissolved off the wall of the bulb by hydrochloric acid, a gelatinous membrane remains, which gives the reactions of silica. When potassium vapor is used, the glass opposite the aluminum cathode is roughened. In parts sheltered by screens from the discharge the glass is not attacked. In potassium vapor the aluminum cathode is not evaporated to any marked degree. Opposite the cathode, both in the mercury vapor and potassium vapor bulbs, a dark, annular stain of the shape of the cathode is formed. This stain resists the action of strong, hot hydrochloric acid, nitric acid, aqua regia and potash solution. The action of hydrochloric acid removed it apparently by dissolving the glass. The tests indicate carbon, but the quantity of the stain is too small to make certain. The stain is also formed on screens of mica, quartz and calcite. Monatomic gases appear to permit the evaporation of aluminum, as Professor Callendar has observed its evaporation in an argon vacuum tube."

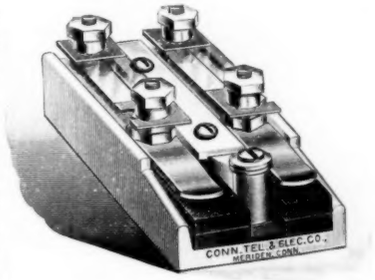
A Consolidation of Rubber Goods Manufacturers.

The American Hard Rubber Company, of New York city, with a capital of $2,500,000, has been incorporated. This new company will purchase the business of the India Rubber Comb Company, of New York, the Butler Hard Rubber Company, of New Jersey, and the Goodrich Hard Rubber Company, of Ohio. The directors are Fritz Achelis, Richard Butler, Charles A. Hoyt, Albert T. Morse, Edwin W. Belcher, William W. Weitling and Frederick G. Dow, of New York city, and George T. Perkins and Henry C. Corson, of Akron, Ohio. A large proportion of the company's product is used for electrical purposes.

A Lightning and Sneak Current Arrester.

Appreciating the demand for a first-class lightning and sneak current arrester, the Connecticut Telephone and Electric Company, of Meriden, Ct., have devised the apparatus shown in the accompanying illustration.

After placing a large number of these arresters in operation and subjecting them to a series of very severe



A LIGHTNING AND SNEAK CURRENT ARRESTER.

tests, the manufacturers state that they are convinced of their efficiency as a high-class device for protecting switchboards or instruments from the elements or foreign currents.

A New X-Ray Tube.

Since the power of X-ray generation has been increased it has been found that the anode of the ordinary tube has been quickly destroyed when placed in the focus point of the cathode rays. To overcome this difficulty a tube with a hollow anode, cooled with a stream of water or compressed air, has been constructed. With such a tube unlimited power

A NEW X-RAY TUBE.

can be used without destroying the anode, thus prolonging the life of the tube. This type of tube is known as the "A-W-L" tube, and at present is manufactured exclusively by Kirmayer & Oelling, Boston, Mass.

Central Electric Company Moves.

The Central Electric Company, of Chicago, on May 1, will remove its business to larger and more convenient quarters at 264 to 270 Fifth avenue, Chicago. The company's numerous friends and customers are requested to note and use the new address.

The Erie Telegraph and Telephone Company added 620 subscribers to its system in March. Total number of its subscribers connected on April 1 was 25,692.

Buffalo General Electric Company.

At a recent meeting of the stockholders of the Buffalo, N.Y., General Electric Company the following were elected directors of the company for the ensuing year: Daniel O'Day, George Urban, Jr., J. T. Jones, J. M. Brinker, R. L. Fryer, Wilson S. Bissell, Charles R. Huntley, Samuel S. Spaulding, Franklin D. Locke, H. W. Burt, S. Dana Greene and P. P. Miller.

A permit has been granted by the Bureau of Buildings to the Buffalo General Electric Company to erect a new building at Seventh and Wilkeson streets, Buffalo, N.Y. The building, which is to be a step-down station, will be especially equipped for the transforming of Niagara power, which will be used by the company. The building will cost about $22,000.

Romantic Story Involving the Telephone.

Under this heading the ELECTRICAL REVIEW recently printed a story describing a suit brought to secure for Mrs. Alexander Graham Bell her interest in a trust fund of $200,000, created for her benefit by a contract between her father, the late Gardiner G. Hubbard, and Prof. Alexander Graham Bell when she married Professor Bell.

He conveyed all his telephone patent interests to Mr. Hubbard to hold in trust for Mrs. Bell.

The *Inventive Age* quotes the story from the ELECTRICAL REVIEW and states that the suit was a friendly one between all parties for the purpose of making the proper record, and that a decree in accordance with the equity of the case has since been granted.

Underground Trolley in New York.

After the war is over electricity will replace the cable of the Broadway and Columbus avenue lines in New York city. The Metropolitan Street Railway Company has completed preparations for the change. To make the change the company had to obtain the consent of owners of more than one-half in value of the property along Broadway and Columbus avenue, which has been done.

A Proper Name.

[*From Lightning, London.*]

Mr. Faithfull Begg advocated the immediate acquisition of all telephone systems by the state, which means, I presume, by the post office, a scheme somewhat inconsistent with his criticism of the incapacity displayed by that department in the early days of telephony.

A New Storage Battery.

At Souderton, Pa., the first demonstration of a unique form of storage battery is being made for use in lighting the town. The construction of this storage battery is worthy of description, as it is a radical departure. The illustration, Fig. 1, gives an idea of its appearance. It is formed of 110 sheets of lead, in the form of a great dinner platter, one sheet laid one above the other. The size of these sheets is six feet wide by seven in length, and the height of the battery is about seven feet, with a total weight of 16 tons. The feature that strikes one is that no chemical immersion is used. The basic principle on which the inventor has developed this system of electric storage has been that a battery might be evolved which would furnish any desired potential in a form adaptable to any character of work. As a result of these ideas and long years of effort, Professor Edgerton developed this form of battery, making each plate form, as it were, a couple by itself, one side acting as the positive and the other as the negative, so that the number of plates essential was reduced one-half. With the exception of the bottom plate, each one is coated on its lower side with one-eighth of an inch of litharge for the formation of the negative side of the plate, the upper side being in the shape of a huge dish, on which red lead to the depth of one-eighth of an inch is placed and covered with a thin layer of asbestos. Again, this asbestos is covered with a layer of pulverized oak charcoal, and over it all is a thin sheet of muslin. This process is carried out with each individual plate, which of itself constitutes a positive and a negative, resulting in an electro-motive force of 2.2 volts between each two contiguous plates. And here a prominent feature of the battery is, that only a slight bath of sulphuric acid is siphoned between the plates, which being absorbed, is held by the granulated charcoal.

When a representative of the ELECTRICAL REVIEW saw the battery installation at Souderton illustrated herewith, a voltmeter by actual measurement showed a difference of potential of 225 volts on open circuit, and the projectors claim that its normal capacity is 300 ampere hours. The plant for which this battery furnishes power consists of 24 arc lights and 600 incandescents. For charging, two dynamos of the Eddy type of 40 kilowatts capacity are employed, and also a third machine built by the Electro-Dynamic Company. The cell is charged at a density of 250 amperes, but it is claimed that this may be raised to 2,000 for a short time without injury. Up to the present time this is the largest battery constructed by the company, but they say that one is in process of construction which will deliver 1,000 volts, and according to the theory of the battery there is hardly a limit to the potential which may be obtained from cells of this form. In showing the installation, the representative of the company said that strong claims for the cell were that it was impossible for any of the active material to drop from the plate, therefore constantly maintaining the original capacity and at the same time preventing short-circuiting between the plates; also that the current passes through from one plate of the cell to the next with perfect uniformity of density, each square inch giving and receiving an equal current at every point so that the action of the active material is uniform throughout; and that the feature of the terminals is practically eliminated, as only three terminals are necessary, in this battery of 220 volts, one in the center and one at each end plate.

FIG. 1.—220-VOLT HIGH-TENSION STORAGE BATTERY AT SOUDERTON, PA., USING 110 LEAD PLATES AND NO CHEMICAL IMMERSION.

The company have now constructed various sizes and forms of this battery adaptable for isolated lighting plants, motor carriage work, medical purposes, and in fact for use wherever the storage battery system can be adopted.

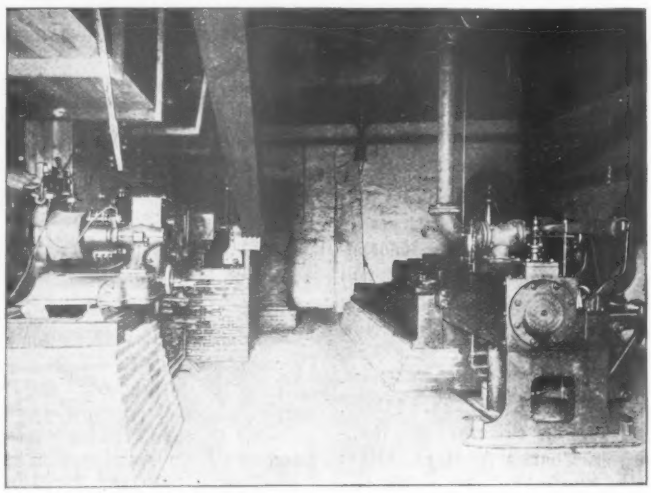


FIG. 2.—ENGINE AND DYNAMO INSTALLATION FOR CHARGING 220-VOLT HIGH-TENSION BATTERY.

The plant described in detail is not the only lighting plant which they have already in operation. A smaller one is in use in the Independent Building at Souderton, operating 20 16-candle-power lamps, which also furnishes power to run a cylinder press and a paper folder. In addition to the new factory recently built, which is being equipped with modern machinery at Souderton, Pa., the company has offices at 1215 Filbert street, Heed Building, Philadelphia. The officers of the High-Tension Electric Storage Company are Prof. N. H. Edgerton, president; J. B. Alderfer, general manager; Dr. Joseph H. Wilson, vice-president; A. M. Gissinger, secretary, and J. K. Clenner, treasurer.

INDUSTRIAL NOTES.

St. Louis Electrical Supply Company reports an increasing demand for the Meston fan motor, especially from the southern territory, where the season is a little in advance of the northern states. In fact, by noting the localities where orders come from, one can easily determine just where Summer weather has made its appearance.

The Walker Company will exhibit at the electrical exhibition at Madison Square Garden two of their No. 20 L motors mounted on truck; one No. 20 L motor, dismantled to show construction; two No. 4A street-car motors, mounted; one 50-kilowatt belted alternator; one 50-kilowatt steel lighting generator, direct-connected to Armington & Sims engine, complete with switchboard, type "S" controllers, assembled and dismantled; railway switchboard complete with feeder and generator panels, ornamental arc lamps, new Walker recording wattmeter, and a large display of photographs of its apparatus. Besides these there will be a complete section of the new underground conduit with a Broadway car shown in operation.

Circular No. 2 of carbon field rheostats, just issued by the Raster Carbon Rheostat Company, Chicago, shows a most complete line of field regulators, from 75 to 500 volts, with a carrying capacity covering all possible requirements in adjusting motor or generating fields. Up to a comparatively short time ago, the use of carbon as a resistance medium had met with numerous failures, but through persistent efforts and after numerous experiments, the Raster Carbon Rheostat Company has succeeded in perfecting a carbon resistance which seems a nearer approach to success than has yet been reached. Users of resistance devices, whose present apparatus suffers from excessive heating, is bulky and has other objectionable features, should give the Raster carbon resistance a trial. The company sends descriptive pamphlets free to any address.

Massachusetts Institute of Technology, Boston.

The collection of physical apparatus has recently received a number of important additions. Among these should be mentioned particularly a large automatic mechanical air-pump made by Ritchie. This has been supplied from the fund bequeathed to the institute by the late Mrs. Katharine Bigelow Lowell. It will be of much use in connection with the lectures on physics.

Also many new vacuum tubes have been procured. The discovery of the X rays by Roentgen two years ago induced a great interest in the study of the phenomena attending the passage of electricity through vacuum tubes. The institute had a very good collection of Crookes tubes, comprising all the ordinary forms, many of which were "used up" in early experiments in which they were over-driven by being used as the source of X-rays. Additions made during the past year have rendered the collection of vacuum tubes of all kinds exceptionally complete, probably the most so of any in the country. Besides the usual low-vacuum tubes and Crookes tubes in large variety, there are many novel forms illustrating peculiar phenomena and various new discoveries, including a number of original design and construction. Among low-vacuum tubes there may particularly be mentioned crown tubes for illustrating the phosphorescence of gases, the curious Holtz tube showing the influence of funnel-shaped apertures on the resistance, a series of Hittorf's "long-way tubes" showing how, at a certain pressure, the electrodes must be separated by a considerable distance in order that a discharge may pass directly between them; partition tubes for showing the exsistence of a great resistance of passage between a metal and a gas; a series of tubes at various exhaustions for clearly exhibiting the changed luminous phenomena due to change in pressure of the residual gas; a like set for showing particularly the change of gaseous resistance under like circumstances. A very interesting series comprises the electrodeless tubes used by Prof. J. J. Thomson in his studies of the true resistance of gases.

Various others illustrate the researches of Nikola Tesla, and other investigators in the direction of utilizing the electric discharge as a means of illumination. A particularly beautiful series illustrates the effect of electric discharge in causing phosphorescence of minerals.

A New Carbon Catalogue.

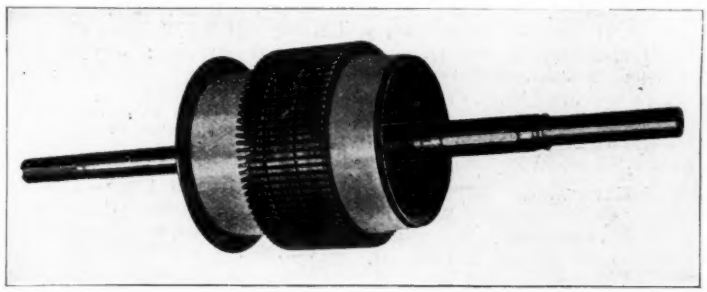
The Globe Carbon Company, of Ravenna, Ohio, manufacturers of high-grade carbon goods for all electrical purposes, have just issued a remarkably complete and handsome catalogue illustrating and describing their manufactures. These include electric light carbons, motor and dynamo brushes, special carbons for filters, lightning arrester carbons, telephone carbons and battery elements. The Hayden, Globe, Fuller and Le Clanche batteries of the wet, semi-dry and dry types are also manufactured by this company. Mr. M. M. Hayden, who is well known in the electrical field, is the manager of the Globe Carbon Company.

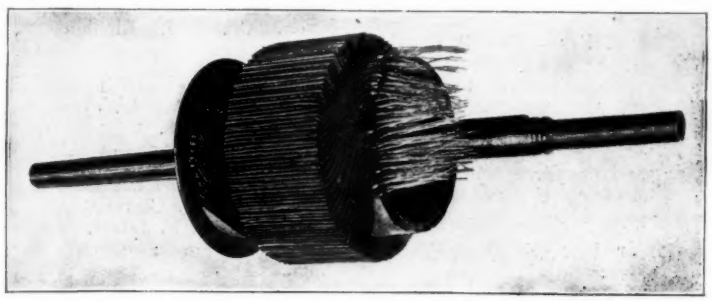
Editing by the Golden Rule.

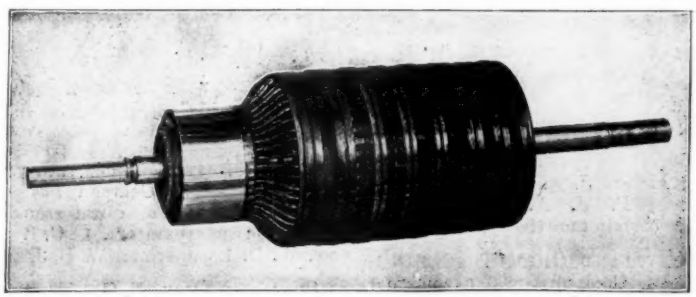
A country editor puts the old question in new shape and says to his subscribers: "Brother, don't stop your paper just because you don't agree with the editor. The last cabbage you sent us didn't agree with us either, but we didn't drop you from our subscription list on that account."—*Gordon, Neb., Journal.*

Direct-Current Armature Construction.

In the construction of the armatures of all direct-current generators and motors built by the General Electric Company, especial care is had to the production of as perfect and durable a part as possible, without sacrificing any detail essential to efficiency and perfect operation. New ideas have been incorporated, and old and tried features retained; the wire, iron and copper, must reach a certain standard of excellence or be rejected; each step in construction is carefully inspected, and the completed armature is subjected to a test many times more severe than the severest conditions which would be met with in actual service. Nothing is left to chance.







FIGS. 1, 2 AND 3.—DIRECT-CURRENT ARMATURE CONSTRUCTION.

In the armatures of the new type of slow and moderate speed direct-current generators and motors, these characteristic features are strikingly apparent. The completed armature is a slotted body of barrel shape, so built that no part is susceptible to movement or vibration. There are no sharp bends to the wire over sharp metallic edges, and each coil is so laid on the core that the outer periphery of the core itself affords it complete protection from mechanical injury.

The spider castings holding the slotted sheet-iron laminations are extended into cylindrical flanges at both ends. The coils previously shaped on a form are laid in the slots, and the ends lie along those flanges at each end of the spider, instead of being bent down sharply toward the shaft. The coils are formed and insulated before assembling on the core in order that, before application in their final position, they may undergo a careful test, and no coil is used that does not emerge from this with insulation intact. The insulation used is similar to that employed in the G. E. railway motors, and in the operation of these has given ample proof of its excellent qualities. It is tough, impervious to moisture and practically indestructible, except under abnormal overload, while it affords high resistance to puncture, rendering injury from lightning extremely improbable. The insulated coils are laid in place in insulated slots in the core, and are simply pressed home.

The cylindrical winding has many positive advantages claimed for it. A very large radiating surface is provided for the conductors, and this, combined with special air ducts for the passage of currents of air through the core from the interior outwards, tends to keep the armature cool; the length of wire is reduced to a minimum and consequently the losses due to armature resistance are also reduced, while the efficiency of the machine is greatly increased. The complete coil being formed separately and then applied, any one or more coils may readily be removed and placed. The coils are firmly secured in the slots on the cylindrical extensions, so that no part can move or vibrate. Indeed, rigidity is one of the most important advantages of the cylindrical winding, since, without motion of the parts, neither injury nor deterioration of the insulation is likely to occur. The ends of the coils are curved down to the commutator, and the connections are so arranged that open circuiting is impossible. The illustrations show the three different steps in the construction of a General Electric slow and moderate speed generator armature, from the completed core to the completed armature. Fig. 2 shows the method of applying the coil to the core.

ADVANCE INFORMATION

New Electric Railways.

LANCASTER, PA.—The Pennsylvania Traction Company will be reorganized and the electric roads extended all through Lancaster County.

WALTHAM, MASS.—The Newton Street Railway Company has been granted franchise to build an electric line to Lexington.

UTICA, N. Y.—Plans are under way for the construction of trolley lines east and west of this place, which will give rapid transit from Little Falls to Rome, a distance of nearly 40 miles, with this place as the center of the system.

BERKELEY, VA.—The Berkeley Electric Light and Power Company is having plans and specifications prepared for a proposed new plant.

HAMBURG, ARK.—Waterworks and electric lights will be furnished by the Arkansas Improvement Company.

HOUSTON, TEX.—The Citizens' Electric Light Company is making every effort to re-establish a light service.

BRUNSWICK, ME.—The Brunswick Electric Light and Power Company is adding a large Westinghouse electric generator to its plant.

PERKASIE, PA.—Carey B. Nace has been awarded the contract to build an electric light plant at this place for Edinger & Company.

BORDENTOWN, N. J.—Bordentown City Council has awarded the contract for lighting the city for the ensuing year to the Bordentown Electric Light and Motor Company for $3,600.

BELMONT, N. H.—A. L. Franks & Company, of Manchester, have closed a contract with Charles O. Judkins to put in an electric lighting plant here, to be in running order by the first of May.

COPPEROPOLIS, CAL.—Union Electric Power and Light Company has been incorporated. Directors: Oliver Ames, of Easton, Mass.; Samuel Carr, of Boston, Mass.; G. McM. Ross and Benjamin Johnson, of Copperopolis, and F. D. Nicol, of Stockton.

SALMO CITY, IDAHO—The Salmo City Electric Light and Power Company has been incorporated. The capital stock is $10,000. Directors: G. G. Shaver, William F. Boxwell, William Peterson, W. T. Robinson, R. W. McBride and E. Mingle.

ST. CATHARINES, ONT.—An electric railway line between St. Catharines and Port Dalhousie will be laid at an early date. H. C. Symmes, of Niagara Falls, South, is interested.

LAPORTE, IND.—The County Commissioners have granted a franchise to Hon. John W. Lovett and W. W. Huffman, of Anderson, this state, to build an electric railroad from here to Michigan City, 12 miles.

New Incorporations.

NIAGARA FALLS, N. Y. — The Carbide Lighting Company has been incorporated to deal in lighting machinery and supplies; capital, $100,000; directors, Joseph P. Devine, of 120 Lexington avenue, Buffalo; Jerome B. Rice, of Cambridge; John C. Frost and T. J. Wilcox, of Niagara Falls, and Frederick Overburg, of New York city.

CHICAGO, ILL.—The Bidwell Trolley Car Company has been incorporated; capital, $5,000.

CHARLESTON, W. VA.—The Campbell Electric Traction Company has been incorporated, with an authorized capital of $100,000, to manufacture and sell electrical and mechanical supplies for railway companies. The incorporators are A. C. Gunther, D. M. Black, Richard Fisher, E. A. Botkin and C. W. Smith, all of this place.

PHILADELPHIA, PA.—The Construction Company has been incorporated with $50,000 capital. The incorporators are William D. Barnard, William Hoopes, Edgar M. Yarnall, John Mustard and George E. Johnson.

ORLANDO, FLA.—The Peninsular Electric Light and Power Company has been incorporated by B. C. Abernathy, A. MacCallum and W. B. Tucker, to supply electric light and power, construct electrical machinery and apparatus and purchase and sell electrical goods of all kinds; capital stock, $12,000.

CHICAGO, ILL.—Farnham Electric Company has been incorporated by E. W. Farnham, H. Burkholder and G. E. M. Pratt, for manufacturing purposes; capital stock, $15,000.

CLEVELAND, OHIO—The Williams Electric Company has been incorporated to manufacture telephones, telephone bells and general electrical and mechanical appliances. The capital stock is $25,000 and the incorporators are J. A. Williams, Will G. Meade, F. J. A. Keller, B. S. Chamberlain and George Gebhard.

CLEVELAND, OHIO—The Northern Transit Company has been incorporated by W. A. Collier, W. B. Snavely, F. S. Masten, Geo. Hausheer and B. E. Sep; capital, $60,000.

TORONTO, ONT. — The Vankleek Hill Electric Company, Limited, has been incorporated; capital, $15,000.

INDIANAPOLIS, IND.—The Jenney Electric Manufacturing Company has been incorporated; capital stock, $50,000.

MARTINSBURGH, W. VA. — The Standard Electric Magnetic Power Company has been incorporated by R. Miles Robinson, W. L. Teter, F. S. Seaman, M. L. Ritter and F. C. Stalnaker, to operate an electric plant; capital limited to $5,000,000.

SOUTH BEND, IND.—South Bend Electric Company has been incorporated; capital, $40,000.

New Telephone and Telegraph Companies.

MINNEAPOLIS, MINN.—The Minneapolis Mutual Telephone and Telegraph Company has been incorporated by D. L. Tallman, Charles Webster, D. C. Jones, C. S. Cairne, A. Webster, E. G. Potter and Andrew Larson; capital stock, $300,000.

NEWTOWN, PA.—The Standard Telephone Company has been incorporated, with a capital stock of $10,000.

CHICAGO, ILL.—American Electric Telephone Company has been incorporated by C. C. Bulkley, W. D. Latimer and W. B. Jarvis for manufacturing purposes; capital stock, $100,000.

HARLEYSVILLE, PA.—A new telephone line will connect this place and Telford.

MOUNT GILEAD, OHIO—The Morrow County Telephone Company has been incorporated, with a capital stock of $12,000, to construct and operate a telephone line from Mount Gilead to Butler, Richland County, with branch lines extending into Delaware, Marion, Crawford, Richland and Knox counties.

DOVER, DEL.—The telephone line between this place and Willow Grove has been completed.

CHICAGO, ILL. — Long - Distance Telephone Company has been incorporated by E. C. Cleveland, W. D. Latimer and W. B. Jarvis, to manufacture telephones; capital stock, $2,500.

EAST FORK, KY.—A movement is on foot to build a telephone line from this place to Louisa, by way of Fallsburg.

AFTON, N. Y.—The telephone line from this place to Windsor is in course of construction.

CHICAGO, ILL. — The American Electric Telephone Company has been incorporated, with a capital stock of $100,000; incorporators, C. C. Bulkley, W. D. Latimer and W. B. Jervis.

SCOTLAND NECK, N. C.—The Scotland Neck Telephone Company has been incorporated; capital stock, $4,600; incorporators, M. Hoffman, N. B. Jones, A. M. McDowell.

RUSSELLVILLE, TENN. — A telegraph office has been established here.

CAYUGA, IND.—Zeb E. Booe and Grant Gossett, of Fountain County, have purchased the Cayuga telephone exchange and lines. They already have a line to Eugene and Newport and contemplate operating a line to Silverwood and Waterman.

STRANGER, TEX. — Blue Ridge Telephone Company has been incorporated; capital stock, $1,000; purpose, establishing and maintenance of a telephone line between this place and Marlin; incorporators, W. S. Hunnicutt, J. C. Shaw and R. J. Garrett.

Electric Light and Power.

LEWISTON, MONT.—The Citizens' Electric Light Company, G. W. Cook, president, may give information concerning construction of a plant for 1,000 incandescent lamps.

HENDERSON, KY.—Mayor Thompson may be addressed concerning construction of electric light plant.

WESSON, MISS. — Mayor H. M. Buckley may be addressed concerning construction of electric light plant.

DECATUR, ILL.—Decatur Gas and Electric Company has been incorporated by W. C. Johns, G. C. Danforth and Joseph Housam, to operate an electric plant and manufacturing purposes; capital stock, $400,000.

JACKSON, MISS.—G. S. T. Carnes, of Memphis, Tenn., and H. H. Corson, of Schenectady, N. Y., have franchise for erection of electric light plant.

MOUNT OLIVE, N. C.—J. D. Williams, of Kenansville, N. C., will establish an electric light plant at this place.

MASON, TEX.—A company is being formed here to put up an electric light plant.

PRESCOTT, ARK.—Ground has been broken for a fine system of waterworks and electric lighting plant to be put in operation by July 1. The cost will be $32,000.

SAYREVILLE, N. J.—The Sayreville Electric Light and Power Company has been incorporated; capital, $4,000; corporators, Peter Fisher and Edwin A. Fisher, of this place, and James R. Sayre, Jr., of Newark.

GETTYSBURG, PA.—The People's Electric Light, Heat and Power Company has been incorporated; capital, $2,000.

MCGRAW, N. Y.—There is talk of starting an electric light plant at this place. Pudney & Ensign are the projectors.

NASHVILLE, TENN.—An electric light plant has been put in by the Ducktown Sulphur, Copper and Iron Company.

ROGERS CITY, MICH.—A franchise has been granted to S. Baker & Company for an electric light plant for this place.

LAMAR, COLO.—An electric plant and telephone system is to be established.

Business Troubles.

NEW YORK, N. Y.—The Sheriff has received an execution against the Electric Self-Playing Piano Company, of No. 66 East Houston street, for $5,278 in favor of Hattie C. Davis on an assigned claim of George Howlett Davis for services and money lent to the company in the last three years.

NEW YORK, N. Y.—The Imperial Electric Company, 140 Washington street, has been sold out by the sheriff.

Kindred.... ...Interests

"**Tape Talk,**" a cute folder from the Central Electric Company, Chicago, tells some interesting facts about Okonite tape and Manson tape.

The Mica Insulator Company, of New York and Chicago, recently received a very handsome order of 26,000 segments from an electric motor company. The company report an excellent business in all directions.

The Western Electric Company, Chicago, announces that it has the exclusive agency for the Sprague Electric Company's conduit, and has in stock in Chicago a large and complete supply of interior conduit of all sizes, upon which it is prepared to quote the lowest prices.

The Newton Appliance Company, 120 Liberty street, New York, is doing an excellent business in flush switches, fixture arm switches, bug cut-outs, etc. The company is fast winning a prominent position in this branch of the electrical field, and users of this class of apparatus will find it to their interest to communicate with them.

The new loricated conduit recently put on the market by the Safety Conduit Company, Rankin Station, Pa., has met with excellent success, so much so, in fact, that a member of the company was able to show the correspondent of the ELECTRICAL REVIEW orders to the amount of 1,000,000 feet of this conduit, which had been placed with them since January 1.

The Walker Company, in circular 1,071, just published, give the story in detail of the recent trolley decision in their favor. This suit was brought on claims two and four of the Van Depoele patent, and, it will be remembered, the United States Circuit Court of Appeals reversed the order of the lower court, which had granted a preliminary injunction. The circular contains the decision in full.

The Berlin Iron Bridge Company, of East Berlin, Ct., have just completed at Grand avenue, New Haven, Ct., a steel bridge 427 feet in length, 52 feet in width, with one roadway and two sidewalks. The approaches on the bridge consist of two deck plate girders. The draw span is 200 feet in length and is operated by electricity, the same means being employed for lighting the bridge throughout. The bridge is of very heavy construction, the roadway being paved with vitrified brick adapted to the heavy city traffic.

The Sprague Electric Company, of New York city, have just received from the John Stephenson Company, Limited, another large contract for Lundell power motors, with which to equip their blacksmith and machine shops. The John Stephenson Company, as is well known, are erecting a new car-building plant at Elizabethport, N. J., and for this plant the Sprague Electric Company have secured contracts for Lundell motors for the mill shops, cabinet shop and blacksmith and machine shops.

The Central Electric Company, of Chicago, is now furnishing the celebrated Manson tape put up in neat tin boxes holding one-half pound each. This innovation will be readily appreciated by the many users of this product, as it preserves the tape in a fresh condition and also prevents filings and the many particles of metal always found in a "kit" or on a bench from adhering to the tape and destroying its effectiveness. This company is carrying in stock a full and complete line of the celebrated McIntyre connectors, as well as the various tools used in connection therewith.

A. L. Ide & Sons, Springfield, Ill., the well known engine builders, were granted a patent, April 5, on "combined shaft and disk." This refers to the construction of the improved crank shafts now used in the "Ideal" engines manufactured by this firm, which consists of shaft and disk of one piece of gun metal, or one integral casting, with steel core or strengthening rod cast in the center of the shaft and made a part thereof. The manufacturers announce that this construction has been used by them for several years past, and, owing to the great strength of this patented construction, out of several thousand engines equipped with these shafts not one has failed to withstand the greatest strain of the most exacting service. It is stated that the gun metal makes a more serviceable, better wearing and more perfect bearing than a shaft where the steel comes in contact with the babbitt of the bearing.

Several agencies for the Jersey Electric Company, of Newark, N. J., have recently been established throughout New England by Mr. Harry Gregory, treasurer of the company. The company was started last January, and has made a specialty of renewing burned-out incandescent lamps. Since that time they have rapidly increased their business. Cellulose filament is always used in renewing a lamp, and by this means the lamp is made as durable and gives as strong a light as when first manufactured. Mr. Thomas G. Wescott is the general manager of the company, and has offices at 744 Broad street, Newark, N. J. It is his present intention to further extend the business by also placing some agencies throughout the West.

J. Jones & Son, New York, will show a general line of electrical supplies and give prominence to those goods which they manufacture, at the Electrical Exposition. They will be located on the right-hand side of the Garden by the first stairway leading to the promenade. Against this stairway they intend to place a very handsome switchboard containing different switches of their make, and it will be a sample of a thoroughly up-to-date board. The right-hand side will take a row of panel boards of different styles. In the foreground, facing the aisle, will be a table upon which will be shown a quantity of heating apparatus, and to the right-hand side there will be a third table with medical battery apparatus, alarm clocks and goods of kindred description. Over the

"MUNICIPAL OWNERSHIP VERSUS PRIVATE CORPORATIONS,"

WITH LEGAL AND EDITORIAL OPINIONS, TABLES AND COST OF LIGHTS, AS FURNISHED BY PRIVATE COMPANIES AND MUNICIPAL PLANTS, WITH LIST OF MUNICIPAL PLANTS THAT HAVE BEEN SOLD OR ABANDONED. CONTAINING, ALSO A COMPARISON OF ENGLISH AND AMERICAN GAS AND RAILWAY PLANTS." : : : :

BY M. J. FRANCISCO.

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center they intend to hang a new arc lamp which they propose to put upon the market at an early date.

The John A. Roebling's Sons Company, of Trenton, N. J., have completed and shipped a cable, 30 miles in length, to the Western Union Telegraph Company at Seattle, Wash. The cable is one and one-third inches in diameter, and for its transportation 11 cars were required.

The Globe Carbon Company, of Ravenna, Ohio, have issued a new kind of calendar with which is combined a mail scale. It is a neat advertising novelty and must be seen to be appreciated. The ELECTRICAL REVIEW understands that the calendar may be had free on application.

At the Hotel Gerlach, 49–55 West Twenty-seventh street, New York city, Mr. C. O. Baker, Jr., president, has engaged a large banquet-room and parlors as a general meeting-room and headquarters for delegates and visitors to the Second Electrical and Kindred Industries Exhibition, to be held in Madison Square Garden in May. The rates at this hotel are $2 to $3 a day for room and bath, and meals are served on every plan. The hotel is very convenient to Madison Square Garden, where the exposition is to be held.

The Lynn Incandescent Lamp Company, of Lynn, Mass., are congratulating themselves over the fact that their business during the past Winter has been of a most satisfactory character. They believe that central lighting station managers are appreciating their efforts to furnish them with a good lamp at a low price, and that the Lynn company is making it possible and profitable for a station manager to use a lamp of a higher efficiency, frequently replaced. The Lynn company is probably the pioneer in the lamp renewal business, and is an important factor in the incandescent lamp field to-day. Mr. E. F. Dwyer, manager of the company, states that nine out of ten of his company's shipments are to old customers, and that five out of eight are to lighting stations.

The C. H. Barrows Company, of New York city, will make an interesting exhibit of electric vehicles at the Electrical Exposition in Madison Square Garden, beginning May 2. A Barrows electric carriage equipped with 20 five-plate special storage cells and a three-quarter-kilowatt motor will be shown as the lightest practical electric carriage ever built. Its weight is stated to be but 650 pounds. Another carriage with 32 seven-plate cells and one and one-half-kilowatt motor, weighing 1,250 pounds, will also be shown. The Barrows vehicles will have only three wheels, the forward wheel being the driver and carrying the entire electric equipment. Its construction makes a carriage practically a mechanical "horse." Various styles of bodies and rear running gear may be used with this "horse."

The War Eagle Mining Company, of Rossland, British Columbia, has placed an order with the James Cooper Manufacturing Company, Limited, of Montreal, for the largest individual air compressor ever built in the Dominion of Canada. When in operation this machine will have a capacity of 50 drills, and will be the pioneer of its class in Canada, being driven by electric motors. Some idea of the size of the machine can be gathered from the size of the flywheel, which is 22 feet in diameter, and will weigh in the vicinity of 25 tons. The War Eagle company also placed with the James Cooper Manufacturing Company an order for a 300-ton electric hoist, to hoist from a depth of 3,000 feet at a speed of 1,000 feet per minute. The average working load will be eight tons. This hoist is one of the largest in the world to be operated by electricity.

The Card Electric Company, of Mansfield, Ohio, report business as booming during the past month to the extent of compelling them to keep a night force at work. Among the numerous large orders received by them are: One 225-kilowatt generator to M. A. Bradley, Cleveland, Ohio; one 100-kilowatt direct-connected generator and one five-horse-power motor to the Cleveland Shipbuilding Company, Lorain, Ohio; one 75-kilowatt generator, one 50-horse-power and one 15-horse-power motor to Atrostel & Son, Milwaukee, Wis.; eight electro-plating dynamos to Bennett & O'Connell, Chicago, Ill.; one 100 kilowatt generator and one 100-horse-power motor to Harter Milling Company, Fostoria, Ohio; one 150-kilowatt generator to Elwood Street Railway Company, Elwood, Ind.; one 15-horse-power motor to National Carbon Company, Cleveland, Ohio; one 50-kilowatt generator and one 20-horse-power motor to Wolverine Manufacturing Company, Detroit, Mich.; one 35-horse-power motor to Citizens' Electric Street Railway, Light and Power Company, Mansfield, Ohio; one five horse-power motor to T. P. Ford, New York, N. Y.; one 25-horse-power motor to Ship Owners' Dry Dock Company, Cleveland, Ohio. The company have just completed some important extensions to their plant, and intend making several more additions during the early Summer.

NOTICE TO CONTRACTORS — SEALED proposals for furnishing the materials and performing the labor required and necessary for installing the electric light wiring for the eastern approach, porticos and lobbies, and completing the electric wiring for the western staircase and fifth story of the state library; also for furnishing the electric light fixtures for the eastern approach, lobbies, porticos and western staircase, for the State Capitol at Albany, N. Y., may be sent by mail or delivered in person up to 12 o'clock noon on the 29th day of April, 1898, to the undersigned at his office in the Capitol, Albany, N. Y.

Only the bids of parties or firms actually engaged in electrical construction work and in the manufacture of electric light fixtures will be considered, and bidders must be able to refer to work similar in character, performed by them elsewhere.

Separate proposals must be made for the electric wiring and for the fixtures, and must be accompanied by a certified check or New York draft for a sum equal to ten per cent of the amount of such proposal to guarantee execution of contract, payable at sight to the order of the Superintendent of Public Works. Said deposit will be retained as a part of the security until the completion of the contract. The amount of bond for the faithful performance of contract, on execution of contract, will be forty per cent of the proposal or proposals, and the amount of labor bond required on execution of contract will be thirty per cent of the proposal or proposals.

The work is to be done with all the speed compatible with good workmanship, and the contractors are required to state the time within which they will bind themselves to complete the work, as the element of time will be considered by the Superintendent of Public Works in awarding the contract.

Drawings and specifications may be seen and blank forms of proposals obtained at the office of I. G. Perry, Capitol Commissioner, in the Capitol, at Albany, N. Y.

Original designs for electrical fixtures, together with plans and specifications, and proposals for furnishing same, as substitute for designs shown as above stated, will be received and given consideration.

The undersigned reserves the right to reject any or all bids as he may deem for the best interest of the state.

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Width of building, 155 ft., out to out, divided into a center span 66 ft., with a wing on each side 43 ft., 6 in.; total length of the building, 350 ft. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an iron foundry, but owing to the failure of the purchaser is now offered for sale at a bargain. Is admirably adapted for a foundry for light or heavy castings, machine shop, car barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.

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One 150-h.-p. Single-Cylinder Ball & Wood Engine, 16 x 16, 250 R. P. M. In first-class condition.

Two 60-k.-w. Edison Bi-polar Dynamos, in A No. 1 order.

One 60-inch 3-ply Leather Belt, 96 feet 0 inch long. Run but a short time.

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Bargains in Dynamos, Engines, Etc.

Direct-current dynamos of 350, 700, 725, 800, 810, 900, 1,075, 1,350, 1,610 and 2,500 light capacity.
Alternating-current dynamos of 750, 900, 1,300 and 2,000 light capacity.
Arc dynamos, 20, 24, 30, 40, 50 and 60 lights, both 1,200 and 2,000 candle-power.
Engines, 50, 75, 85, 100, 115, 125, 150, 175 and 200 horse-power.
Boilers, 100, 250, 375 and 500 horse-power.
Heaters, 150 and 2,000 horse-power.
Pumps, all sizes.

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This apparatus has been removed from our own Central Stations to make room for larger units. We therefore know its history and can guarantee it to be in thoroughly good operative condition.

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED APRIL 19, 1898.

602,422 Apparatus for locating obstructions in tubes; B. C. Batcheller, Philadelphia, Pa.—In an apparatus for locating obstructions in tubes, the combination with an apparatus for visually recording time intervals, of means for co-ordinately recording sound waves, said means being connected with the tube to be tested as described, and so that the sound waves created in the said tube will be visually recorded, and means for wholly or partially interrupting the transmission of the sound waves from the tube to the sound-recording device.

602,429 Valve controller; A. E. Colgate, New York, N. Y.—The combination with a main valve of a valve stem provided with an actuating piston working in a separate chamber and adapted to be actuated by the pressure from the inlet to open said valve, a passage from the inlet to the said chamber and an auxiliary valve for controlling said passage, said auxiliary valve being slightly overbalanced and held to its seat by pressure from the inlet.

602,495 Electric contact shoe; W. M. Brown, Johnstown, Pa.—In an electric contact shoe, a continuous contact member in combination with the continuous elastic member secured thereto.

602,527 Electric measuring instrument; H. W. Sullivan, London, England—In an electric instrument, the combination with an oscillating coil, of an adjustable weight permanently fixed to such coil.

602,548. Electric controller for gas regulators; P. Seiler, San Francisco, Cal.—In a gas regulator having an inlet valve operated by a float inside the regulator, a supplemental weight adapted to be added to said float or removed therefrom by means of electro-magnets being charged or discharged by electric currents.

602,557 Alternating-current meter; C. P. Feldmann, Cologne, Germany.

602,584 Electric railway; H. W. Libbey, Boston, Mass.—In an electric railway, the combination, with a conduit, of two rows of parallel alternately arranged bars, insulatingly embedded in the cover thereof, a supply wire within the conduit, movable conductors between the wire and the bars, and a magnetic trolley, the free end of which is provided with two, one upon each side thereof, and each in electrical connection therewith.

602,596 Electrical apparatus; H. H. Eldred, Brooklyn, N. Y.—In a telephone apparatus, a magneto instrument for signaling: a receiver; a signaling circuit, including the armature of the signaling instrument; a telephone circuit; a switch to throw receiver and transmitter from the signaling circuit, and a second switch to bring the receiver into the signaling circuit.

602,616 Invertible fluid battery; P. R. Cunningham, Washington, D. C.—In an invertible fluid battery, the combination of a closed casing, electrodes, of less height than the interior of the casing, removably inserted therein and designed to be freed from the electolyte when the casing is inverted, and retaining means engaging with the tops of the said electrode but insulated therefrom, and interlocking interiorly with the casing to secure said electrode in a fixed position and against displacement when the casing is inverted.

602,667 Railway switch operating mechanism; C. W. Squires, Springfield, Mass.

602,678 Traveling contact for underground electric railways; G. B. Coleman, Washington, D. C.—The combination with the frame, of the clamps secured thereto, and lead wires provided with insulating tubes, which latter are thickened and flattened with said clamps.

602,706 Clock-controlled switch; F. L. Mackey, New Castle, Pa.—An automatic switch, comprising a disk having locking stops spaced thereon and carrying switch points, means acting on the said disk to rotate it, a pawl engaging the stops to hold the disk, fixed switch points attachable to the circuit, and means operated by a clock to momentarily lift the locking-pawl.

602,709 Apparatus for reducing electric currents and voltage; A. F. Vetter, Long Island City, N. Y.

602,746 Street indicator; E. J. Hall, St. Louis, Mo.

602,767 Electric switch; A. G. McPherson, Highland Park, Ill.—A device for the purpose described, having in combination two isolated contacts, a lever pivoted between said contacts, a longitudinally shiftable piece arranged to connect with either of said contacts, a cross-bar secured to said lever, an elastic connection secured to said shiftable piece and having a bolt passing through said cross-bar, and a handle composed of non-conducting material secured to said cross-bar, and enclosing said bolt.

602,774 Electric muscular exerciser; E. Sandow, London, England—The combination with an elastic-cord exerciser, of handles attached to the cords of the exerciser, wires attached to the handles and extending the length of the cords, being so united with the cords as to be capable of extending with them so as not to interfere with the elasticity thereof.

602,781 Apparatus for controlling electric motors; A. J. Stopher, London, England.

602,815 Electric furnace; G. C. Clark, Galveston, Tex.—In an electric furnace, a revoluble fusing pot having an electrical connection therewith, a carbon electrode supported above the pot, and means for automatically drawing or feeding the material inward toward the carbon electrode as the fusing pot revolves.

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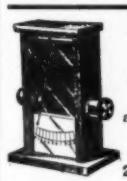

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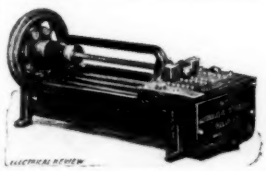

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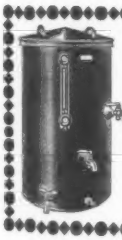

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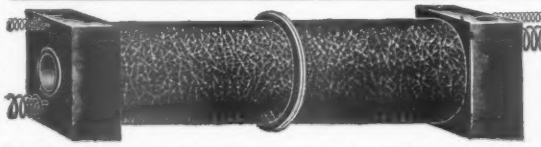
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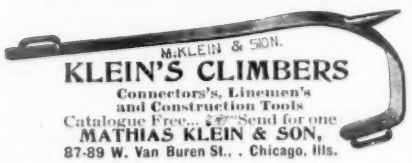
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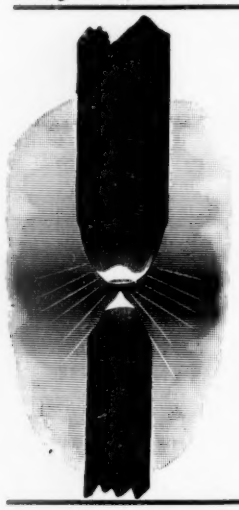

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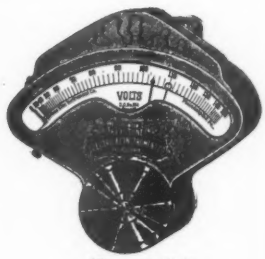

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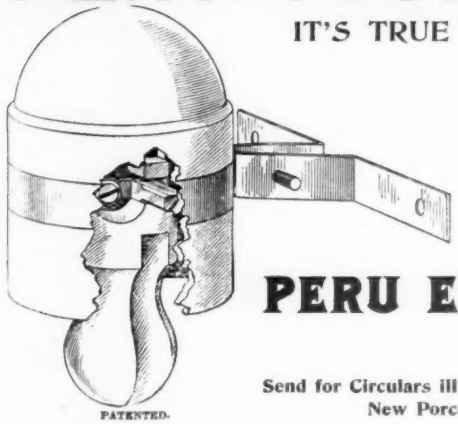

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